



## **Douglas Tougaw, Ph.D., P.E., M.B.A.**

Leitha and Willard Richardson Professor of Engineering  
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### **Education:**

- 2005 M.B.A., Valparaiso University.  
1996 Ph.D., Electrical Engineering, University of Notre Dame.  
Dissertation Topic: “*Quantum Cellular Automata: Computing with Quantum Dot Molecules*”  
1994 M.S., Electrical Engineering, University of Notre Dame.  
1991 B. S., Electrical Engineering, Rose-Hulman Institute of Technology.  
Russian Technical Translation Certificate and Math Minor

### **Professional Experience:**

- 2008-present **Professor**, Department of Electrical and Computer Engineering, Valparaiso University  
2002-2008 **Associate Professor**, Department of Electrical and Computer Engineering, Valparaiso University.  
1996-2002 **Assistant Professor**, Department of Electrical and Computer Engineering, Valparaiso University.

#### *Major Accomplishments:*

- Taught 36 different courses at all levels from freshmen to senior year, including developing completely new courses in engineering ethics and economics, robotics, embedded microcontrollers, digital communications, computer architecture, control systems, and entrepreneurship.
- Led the effort to develop a multidisciplinary senior design course sequence, which has become the capstone of the electrical, computer, and mechanical engineering curricula.
- Established an annual Engineering Design Expo at which students have the opportunity to demonstrate their design work to members of the university and local community.
- Created an on-line electronic gradebook program that was used by more than ten professors and two hundred students.
- Founded a link of the Order of the Engineer, the national engineering ethics society.
- Led the effort to update and improve laboratory facilities for embedded microcontrollers, electronics, and senior projects.
- Led the effort to build six technology-enhanced classrooms in Gellersen Center, including physically building desks and selecting and installing computer hardware and software.
- Advised the student branch of IEEE, quadrupling student participation in meetings and events.
- Organized annual Student Professional Awareness Conference and IEEE Student Night.
- Organized workshops to teach over 100 other faculty how to design course web pages.
- Led an effort to increase entrepreneurial content in the curriculum and in co-curricular activities.

- 2001-2009 **Department Chair**, Department of Electrical and Computer Engineering, Valparaiso University.

#### *Major Accomplishments:*

- Implemented a new computer engineering program and successfully led the effort to achieve ABET accreditation for both degrees.
- Successfully recruited three highly qualified members of the department faculty.
- Developed departmental strategic staffing and laboratory plans.
- Led the effort to develop learning objectives for every course in the curriculum and to standardize course evaluations based on those objectives.
- Developed and implemented a comprehensive assessment plan for both electrical and computer engineering.
- Substantially updated the curriculum for both electrical and computer engineering to increase scientific rigor while improving faculty efficiency.

- 1995-1996 **Postdoctoral Research Associate**, *Department of Electrical Engineering, Univ. of Notre Dame.*

## Honors and Awards:

- 2008 **Dale Carnegie Highest Award for Achievement**  
Selected from among more than 30 students taking the Dale Carnegie course at Valparaiso.
- 2008 **Outstanding Service Award**  
Illinois/Indiana Section of the American Society for Engineering Education
- 2007 **Best Zone Paper**  
Selected from among 1000 papers presented at 16 ASEE regional conferences nationwide
- 2006 **Valparaiso University Alumni Association Distinguished Teaching Award**  
Selected from among all faculty at Valparaiso University
- 2006 **Best Paper Award**  
Illinois/Indiana Section Conference of the American Society for Engineering Education
- 2006 **Fellow of the Kern Engineering Entrepreneurship Network (KEEN)**  
Selected by the KEEN program to promote entrepreneurship education across campus
- 2005 **Outstanding Engineering Educator of the Year**  
Selected from among more than 1000 engineering faculty at 22 colleges in Illinois and Indiana by the Illinois/Indiana section of the American Society for Engineering Education
- 2005 **Eta Kappa Nu Outstanding Young Electrical Engineer Award, Honorable Mention**  
Selected as runner-up for national award given to electrical engineers under 35 years old
- 2004 **Best Paper Award and Best Paper Award, Honorable Mention**  
Illinois/Indiana Section Conference of the American Society for Engineering Education
- 2003 **Leitha and Willard Richardson Professorship of Engineering**  
Selected to hold one of only three chaired professorships in the College of Engineering
- 2001 **Jess Lucas Alumni Leadership Award**  
Given annually to a Rose-Hulman alumnus who has shown exemplary leadership in his career
- 2000 **Sigma Xi Outstanding Researcher of the Year**  
Selected from among hundreds of faculty at universities in northwest Indiana
- 1998-99 **Frederick Jenny Professorship of Emerging Technology**  
Selected to study emerging technologies in the area of microcontrollers and robotics
- 1996 **IEEE Outstanding Graduate Student Teacher Award**  
Selected from among all electrical engineering graduate students at Notre Dame
- 1995 **Burns Fellowship**  
Selected from among all engineering graduate students at Notre Dame
- 1994 **Fellow of the Center for Applied Mathematics**  
Selected from among all engineering graduate students at Notre Dame
- 1991-94 **National Science Foundation Graduate Research Fellowship**  
National fellowship selected from among engineering and science students of all disciplines
- 1991 **Outstanding Senior Electrical Engineering Student Award and the John T. Royse Award**  
Departmental and university awards for outstanding graduate in Rose-Hulman class of 1991
- 1991 **Heminway Gold Medal**  
Valedictorian of Rose-Hulman Institute of Technology class of 1991
- 1991 **Eta Kappa Nu National Electrical Engineering Student of the Year Finalist**  
Selected as one of the ten best electrical engineering students in the nation
- 1990 **Wischmeyer Medal and the Clarence Knepmeyer Award**  
Departmental and university awards for top Rose-Hulman junior
- 1989 **Eta Kappa Nu Outstanding Sophomore EE Student and the Bogart Prize**  
Departmental and university awards for top Rose-Hulman sophomore
- 1988 **Heminway Bronze Medal**  
University award for top Rose-Hulman freshman

### **Selected Professional Service:**

- IEEE Calumet Section Executive Board
  - Helped organize and implement an annual series of technical presentations for this organization of over 1000 electrical and computer engineers.
  - Served as Student Activities Chair, Secretary, Treasurer, Vice-Chair, Program Chair, Section Chair, Junior Past Chair, Nominations Chair, Senior Past Chair, Audit Chair, and Director.
- ASEE Illinois/Indiana Section Executive Board
  - Helped to revitalize the section, which was nearly consolidated into another section due to inactivity just before I began serving on the executive board.
  - Helped organize and implement annual conferences each of the past five years
  - Helped to rewrite the bylaws to bring them into concordance with the national constitution.
  - Served as Section Chair, currently serving as Conference Program Chair (second time), Newsletter Editor, and Director.
- Peer reviewer
  - *IEEE Transactions on Nanotechnology*, *IEEE Transactions on Computer-Aided Design*, *Journal of Applied Physics*, and *American Society for Engineering Education*

### **Selected University Service:**

- Master of Engineering Management Steering Committee (2005-present)
  - Helped design program curriculum and led it through the multi-level approval process
  - Continue to help make curricular and admission decisions for the new program
- Gellersen Renovation Taskforce (2004-present)
  - Led effort to develop a vision statement for the project
  - Provided leadership and vision in taskforce meetings
  - Served as departmental advocate and liaison to the taskforce
- College of Engineering Curriculum Committee (2003-present)
  - Worked with the committee to develop new engineering minors, to revise the general education requirements of the College of Engineering, and to improve the quality of the freshmen course.
- College of Engineering Assessment Committee (2002-present)
  - Represented the ECE department in efforts to standardize and streamline assessment efforts and to use the results to lead to college-wide improvements in the quality of education.
- Science, Technology, Engineering, and Mathematics (STEM) Council (2005-present)
  - Helped to organize and promote multidisciplinary STEM efforts across campus.
- North Central Accreditation Self-Study Steering Committee (2005-2008)
  - Chair of “Acquisition, Discovery, and Application of Knowledge” committee
  - Led effort to collect evidence to support university’s application for reaccreditation.

### **Professional Affiliations and Honor Societies:**

- Institute of Electrical and Electronics Engineers (Senior Member)
- American Society for Engineering Education
- Professional Engineer (Registered in Indiana since 2001)
- Order of the Engineer
- Electrical and Computer Engineering Department Heads Association
- Tau Beta Pi (Honorary Engineering Society)
- Beta Gamma Sigma (Honorary Business Society)
- Eta Kappa Nu (Honorary Electrical Engineering Society)
- Sigma Xi (Honorary Scientific Research Society)
- Pi Mu Epsilon (Honorary Mathematics Society)

## Refereed Scientific Publications:

1. J. Wood and D. Tougaw, "Matrix Multiplication Using Quantum-Dot Cellular Automata," to be submitted to *IEEE Transactions on Nanotechnology*, June 2008.
2. M. Ottavi, L. Schiano, F. Lombardi, and D. Tougaw, "HDLQ: An HDL Environment for QCA Design," *ACM Journal of Emerging Technologies in Computing*, **2**, 243-261 (2006).
3. M. Khatun, T. Barclay, I. Sturzu, and D. Tougaw, "Fault Tolerance Properties in Quantum-dot Cellular Automata Devices," *J. Phys. D: Appl. Phys.* **39**, 1489-1494 (2006).
4. M. Khatun, T. Barclay, I. Sturzu, and D. Tougaw, "Fault Tolerance Calculations for Clocked Quantum-dot Cellular Automata Devices," *Journal of Applied Physics*, **98**, 094904 (2005).
5. D. Tougaw, C. Graunke, D. Wheeler, and J. Will, "Implementation of Crossbar Network Using Quantum-Dot Cellular Automata," *IEEE Transactions on Nanotechnology*, **4**, 435-440 (2005).
6. I. Sturzu, J. L. Kanuchok, M. Khatun, and D. Tougaw, "Thermal Effects in Quantum-Dot Cellular Automata," *Physica E: Low-Dimensional Systems and Nanostructures*, **27**, 188 (2004).
7. M. Khatun, I. Sturzu, L. Kanuchok, and P. D. Tougaw, "Statistical study of thermal effect in quantum-dot cellular automata," *Bulletin of the American Physical Society*, 2004, **49**, 1, p. 978 (2004).
8. S. Henderson, E. Johnson, J. Janulis, and D. Tougaw, "Incorporating Standard CMOS Design Process Methodologies into the QCA Logic Design Process," *IEEE Trans. on Nanotechnology*, **3**, 2-9 (2004).
9. J. Janulis, D. Tougaw, S. Henderson, and E. Johnson, "Serial Bit Stream Analysis Using Quantum-Dot Cellular Automata," *IEEE Transactions on Nanotechnology*, **3**, 158-164 (2004).
10. J. Pasky and D. Tougaw, "Quantum-dot Cellular Automata," *Mesoscopic Tunneling Devices* (2002).
11. J. Pasky, L. Henry, and D. Tougaw, "Regular Arrays of Quantum-dot Cellular Automata Macrocells." *Journal of Applied Physics*, **87** (2000).
12. A. Gin, S. Williams, and D. Tougaw, "An Alternative Geometry for Quantum Cellular Automata." *Journal of Applied Physics* **85**, 8281 (1998).
13. A. Gin, S. Williams, and D. Tougaw, "Hierarchical Design of Quantum Cellular Automata," *Journal of Applied Physics* **85**, 3713 (1998).
14. S. Jizhong and D. Tougaw, "Design of Symmetric Ternary Current-Mode CMOS Schmitt Inverter," *International Journal of Electronics*, **85**, 477-482 (1998).
15. G. H. Bernstein, et. al., "Practical Issues in the Realization of Quantum-Dot Cellular Automata," *Superlattices and Microstructures*, **20**, 749 (1997).
16. C.S. Lent and P.D. Tougaw, "A Device Architecture for Computing with Quantum Dots," *Proceedings of the IEEE*, **85**, 541 (1997).
17. P. Douglas Tougaw and Craig S. Lent, "Dynamic Behavior of Quantum Cellular Automata," *Journal of Applied Physics*, **80**, 8 (1996).
18. P. Douglas Tougaw and Craig S. Lent, "The effect of stray charge on quantum cellular automata," *Japanese Journal of Applied Physics* **34**, 4373-4375 (1995).
19. P. Douglas Tougaw and Craig S. Lent, "Logical devices implemented using quantum cellular automata," *Journal of Applied Physics* **75**, 1818-1825 (1994).
20. Craig S. Lent and P. Douglas Tougaw, "Bistable saturation due to single electron charging in rings of tunnel junctions," *Journal of Applied Physics* **75**, 4077-4080 (1994).
21. Craig S. Lent, P. Douglas Tougaw, and Wolfgang Porod, "Bistable saturation in coupled quantum-dot cells," *Journal of Applied Physics* **74**, 3558 (1993).
22. Craig S. Lent and P. Douglas Tougaw, "Lines of interacting quantum-dot cells: a binary wire," *Journal of Applied Physics*, **74**, 6227 (1993).
23. Craig S. Lent, P. Douglas Tougaw, Wolfgang Porod, and Gary H. Bernstein, "Quantum Cellular Automata," *Nanotechnology* **4**, 49 (1993).
24. Craig S. Lent, P. Douglas Tougaw, and Wolfgang Porod, "Bistable Saturation in Coupled Quantum Dots for Quantum Cellular Automata," *Applied Physics Letters* **62**, 714 (1993).

## Refereed Pedagogical Publications:

1. E. Johnson, D. Tougaw, and M. Budnik, "Teaching Entrepreneurship Throughout an Electrical and Computer Engineering Curriculum," to be submitted to *Proceedings of the American Society for Engineering Education National Conference* (2009).
2. E. Johnson, B. Engerer, K. Leitch, and D. Tougaw, "Teaching Probability and Statistics in a First-Year Engineering Course," *Proceedings of the Frontiers in Education Conference* (2008).
3. E. Johnson, D. Tougaw, K. Leitch, and B. Engerer, "Teaching the Fundamentals of Fluid Mechanics to First-Semester Engineering Students," *Proceedings of the American Society for Engineering Education National Conference* (2008).
4. M. Hagenberger, P. Johnson, D. Tougaw, J. Will, M. Budnik, and K. Sevenser, "Managing Senior Projects: Educating Graduates and Undergraduates in a Senior Project Course," *Proceedings of the American Society for Engineering Education National Conference* (2007).
5. P. Johnson, K. Sevenser, D. Tougaw, and J. Will, "Balancing Learning Objectives and Success in a Multidisciplinary Senior Design Project," *Proceedings of the American Society for Engineering Education National Conference* (2007).
6. D. Tougaw and M. McCuddy, "Implementing a New Approach to Teaching the Ethics of Emerging Technology," *Proceedings of the American Society for Engineering Education National Conference* (2007).
7. D. Tougaw, J. Will, P. Johnson, M. Hagenberger, and M. Budnik, "Integrating Entrepreneurship into Senior Design Projects," *Proceedings of the National Collegiate Inventors and Innovators Alliance Annual Conference* (2007).
8. E. Johnson, S. DeMaris, and D. Tougaw, "Valparaiso International Engineering Program—A Global Experience for Engineering Students," *Proceedings of the American Society for Engineering Education National Conference* (2006).
9. E. Brown and D. Tougaw, "Effectively Recruiting Engineers to Become MBA Students," *Proceedings of the American Society for Engineering Education National Conference* (2006).
10. B. Engerer, M. Hagenberger, and D. Tougaw, "Revision of a First-Semester Course to Focus on Fundamentals of Engineering," *Proceedings of the American Society for Engineering Education National Conference* (2006).
11. C. Polito, D. Tougaw, and K. Olejniczak, "Preparing the Way: Helping Students Discern Engineering as a Vocation," *Proceedings of the Conference on the Role of Engineering at a Catholic University* (2005).
12. D. Tougaw and C. Polito, "Graduate School After the Ph.D.: When is Enough Enough?," *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference* (2006).
13. D. Tougaw and M. McCuddy, "Implementing a New Approach to Teaching the Ethics of Emerging Technology," *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference* (2006).
14. M. Hagenberger, B. Engerer, and D. Tougaw, "Designing a First-Semester Studio Laboratory Course Focused on Fundamentals of Engineering," *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference* (2006).
15. L. Sanders and D. Tougaw, "Integration of Standardized Course Evaluations into a Departmental Assessment Plan," *Proceedings of the Frontiers in Education Conference* (2005).
16. E. Johnson, J. Will, D. Tougaw, and A. Kraft, "Distance Learning: Teaching a Course from a Remote Site to an On-Campus Classroom," *Proceedings of the Frontiers in Education Conference* (2005).
17. M. McCuddy and D. Tougaw, "Learning Challenges in Contemporary Society: Fostering Understanding of the Ethical Implications of Advancing Technologies," *Proceedings of the Educational Innovations in Economics and Business Annual Conference* (2005).
18. M. McCuddy and D. Tougaw, "The Ethical Imperatives of Technological Development: Insights Gained by Using the Individual Human Being as an Analogy for Societies," *Proceedings of the Global Conference on Business and Economics* (2005).
19. D. Tougaw, "Integrating Active and Cooperative Learning Exercises into a Course on Probability and Statistics," *Proceedings of the American Society for Engineering Education National Conference* (2005).

### **Refereed Pedagogical Publications (continued):**

20. D. Tougaw and D. Schroeder, "Teaching a Multidisciplinary Course on Technology, Society, and the Natural Environment," *Proceedings of the American Society for Engineering Education National Conference* (2005).
21. D. Tougaw and J. Will, "Integrating National Robotic Competitions into Multidisciplinary Senior Project Courses," *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference* (2005).
22. P. Tougaw, E. Johnson, S. McMullen, and D. Tougaw, "Summer Programs to Improve Science, Mathematics, Engineering, and Technology Education in K-12 Schools," *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference* (2005).
23. D. Tougaw and M. McCuddy, "Using Childhood Experiences as an Analogy to Teach Students About the Morality of Emerging Technology" *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference* (2005).
24. D. Tougaw and D. Wangrow, "Professional Partners as Adjunct Instructors in Emerging Technology Fields," *Proceedings of the American Society for Engineering Education National Conference* (2004).
25. D. Tougaw and W. Schoech, "Balancing Performance and Cost when Designing a Technology-Enhanced Classroom," *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference*, pp. 75-80 (2004).
26. E. Johnson, D. Tougaw, and A. Kraft, "Use of Classroom Polling Systems to Promote Student Interaction," *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference*, pp. 11-13 (2004).
27. D. Tougaw and J. Will, "An Innovative Multidisciplinary Capstone Design Course Sequence," *Proceedings of the American Society for Engineering Education National Conference* (2003).
28. J. Will and D. Tougaw, "An Integrated Pair Programming Experience," *Proceedings of the American Society for Engineering Education National Conference* (2003).
29. D. Tougaw, J. Will, P. Weiss, and C. Polito, "Sponsoring a FIRST Robotics Team," *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference* (2003).
30. D. Tougaw and M. Barrett, "Determination of Individual Performance on a Team," *Proceedings of the American Society for Engineering Education Illinois/Indiana Conference*, 124-127 (2002).
31. D. Tougaw, "Teaching an On-Line Summer Course: Challenges and Benefits," *Proceedings of the American Society for Engineering Education Illinois/Indiana Section Conference*, 124-127 (2001).
32. D. Tougaw, "An On-Line Gradebook," *Proceedings of the American Society for Engineering Education Illinois/Indiana Section Conference*, 154-157 (1999).
33. E. Johnson and D. Tougaw, "An Integrated Computer Architecture Laboratory," *Proceedings of the Frontiers in Education Conference* (1998)

### **Courses Taught at Valparaiso University:**

1. **ECE 221**      **Digital Logic Design**
2. **ECE 222/223**      **Advanced Digital Logic Design**
3. **ECE 261/263**      **Linear Circuit Theory I**
4. ECE 262      Linear Circuit Theory II
5. **ECE 262 Lab**      **Linear Circuit Theory II Laboratory**
6. ECE 290      Special Project: Robotics
7. ECE 311      Electrical Laboratory IV
8. ECE 315      Internet Applications
9. ECE 320/322      Embedded Microcontrollers
10. **ECE 322 Lab**      **Embedded Microcontrollers Laboratory**
11. ECE 394      Design Project Planning
12. **ECE 365/465**      **Probability and Statistics for Electrical and Computer Engineers**
13. ECE 418      Computer Laboratory V
14. ECE 420      Microprocessor Applications
15. ECE 424/324      Computer Architecture
16. ECE 450      Digital Communication Systems
17. **ECE 460**      **Control System Design**
18. ECE 490      Special Topics: Robotics
19. ECE 495      Senior Design Project I
20. ECE 496      Senior Design Project II
21. ECE 497      Senior Design Project
22. **ECE 499**      **Senior Honors Studies: VLSI Design**
23. **GE 100**      **Fundamentals of Engineering**
24. **GE 301**      **Professional Engineering Practice**
25. **GE 495A**      **Special Topics: Fundamentals of Business for Engineers**
26. **GE 495B**      **Special Topics: Developing the Entrepreneurial Mindset**
27. **GE 497**      **Multidisciplinary Senior Design Project I**
28. **GE 498**      **Multidisciplinary Senior Design Project II**
29. **MBA 602**      **Managing Technology and Innovation**
30. **MBA 790**      **Creativity, Innovation, and Entrepreneurship**
31. **MBA 790**      **Project Management Professional**
32. **MEM 605**      **Engineering Project Management**
33. **MEM 625**      **Project Leadership in Action I**
34. **MEM 626**      **Project Leadership in Action II**
35. **MEM 665**      **Engineering Management Seminar I**
36. **MEM 667**      **Engineering Management Seminar II**

(Courses taught within the past five years are indicated in bold.)