

## Gary Haywood McDonald, Ph.D., P.E.

### Home

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### Office

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### UC Foundation Associate Professor of Mechanical Engineering Director of Freshman Engineering & Advising

Primary areas of specialization are the mechanical systems and energy systems areas in mechanical engineering with some experience in numerical methods, computer modeling from my thesis, dissertation, and research experiences and some experience in mechanical engineering experimentation and data acquisition.

Main areas of interest are:

#### Mechanical Systems

Machine Design  
Mechanism Analysis and Design  
Experimental Instrumentation & Data Acquisition

#### Energy Systems (M.S. & Ph.D.)

Energy Alternatives (MHD)  
Computer Aided Modeling

**Professional Engineering Registration:** Mechanical Engineering  
Tennessee # 20061 – (Active status: 1988 – present)

### Education

Ph.D. in Engineering; Tennessee Technological University,  
Cookeville, Tennessee; August 1984

M.S. in M.E.; Tennessee Technological University, Cookeville,  
Tennessee; August 1979

B.S. in M.E.; Tennessee Technological University, Cookeville,  
Tennessee; June 1977 (with High Distinction)

### Experience

2000-present: *Director of Freshman Engineering and Advising* – appointed January 2000. I coordinate Engineering Freshman Engineering, transfer student, and adult student advising sessions during the summers. I am a regular participant of the faculty-parent panels representing the College of Engineering & Computer Science during the summer Freshman Orientations sessions. I am one of the representatives for the College during Fall and Spring visits and other recruiting events.

- 1992-present: *UC Foundation Associate Professor of Engineering (Mechanical)* at UTC in the mechanical systems area of mechanical engineering. Teach statics, dynamics, mechanics of materials (lecture and laboratory), kinematics and dynamics of machinery 1 and 2, machine design, freshman seminar for engineering, senior seminar and mechanical engineering experimentation lecture and laboratory.
- 1985-1992: *Assistant Professor of Engineering (Mechanical)* at UTC in the mechanics area of mechanical engineering. Taught basic engineering science, statics, dynamics, mechanics of materials (lecture and laboratory), heat transfer, kinematics and dynamics of machinery 1, machine design, and freshman seminar for engineering students
- 1991, 1990  
1988, 1987 *NASA/ASEE Summer Faculty Fellow*, George C Marshall Space Flight Center, Huntsville, Alabama (summer-ten weeks)
- 1985: *Instructor* in the Department of Mechanical Engineering and the Department of Basic Engineering at Tennessee Tech University. Taught heat transfer, vibrations, and FORTRAN '77
- 1979-1984: *Graduate Instructor* in the Department of Mechanical Engineering and the Department of Engineering Science and Mechanics at Tennessee Tech University. Taught statics, dynamics, mechanics of materials, fluid mechanics, heat transfer, vibrations, and mechanical measurements systems while pursuing Ph.D. degree.
- 1977-1979: *Graduate Assistant* in the Department of Engineering Science and Mechanics at Tennessee Tech University. Taught statics, dynamics, and fluid mechanics while pursuing M.S. degree
- 1981-85: *Student Assistant* (1981-84) and *Instructor* in the Design Class (1985) for the American Society of Civil Engineers (ASCE) Secondary Student Training Program. Graded all instructional materials and helped with out-of-class tutoring. Purpose of the program was to expose high school juniors to computers, engineering design, & environmental & energy issues in a four week experience at Tennessee Tech. (summers only)
- 1978-79: *Student Assistant* for the National Science Foundation Secondary Student Training Program. This program was similar to the ASCE summer program but it was for seven weeks at Tennessee Tech University (summers only)
- 1977: Participant in a National Science Foundation Undergraduate Research Program, Tennessee Tech University (summers only)

## **Awards**

*University Outstanding Academic Advisor Award* – nominated by UTC Adult Services and presented at UTC Faculty Honors Day, December 2004

*Outstanding Engineering Faculty Award* - voted by engineering students for outstanding faculty member and awarded during the College of Engineering and Computer Science, Spring Reception, April 2003

*Engineering Student Service Award* - voted by the faculty of UTC Engineering and awarded during UTC Faculty Honors Day ceremony, December 1998

*Outstanding Engineering Faculty Award* - voted by engineering students for outstanding faculty member and awarded during the College of Engineering and Computer Science, Spring Banquet, April 1996

*Cole Outstanding Engineering Teacher Award* - voted by the faculty of UTC Engineering and awarded during UTC Faculty Honors Day ceremony, September 1995

*Norbert Koch Professional Service Award* - voted by the faculty of UTC Engineering and awarded during the UTC Faculty Honors Day ceremony, December 1993

*UC Foundation Professorship* - selected by the UC Foundation Board of Trustees for dedication of teaching, scholarship, and public service, May 1992

*UTC Student Government Association Outstanding Professor Award* - nominated by students and voted by the SGA for teaching excellence; awarded during UTC Honors Day, April 1992

*Outstanding Engineering Faculty Award* - voted by engineering students for outstanding teaching and awarded during the School of Engineering Spring Banquet, April 1992

*Cole Outstanding Engineering Teacher Award* - voted by the faculty of UTC Engineering and awarded during UTC Faculty Honors Day ceremony, November 1991

*Cole Outstanding Engineering Teacher Award* - voted by the faculty of UTC Engineering and awarded during UTC Faculty Honors Day ceremony, November 1990

*Engineering Student Service Award* - voted by the faculty of UTC Engineering and awarded during UTC Faculty Honors Day ceremony, November 1990

*Cole Outstanding Engineering Teacher Award* - voted by the faculty of UTC Engineering and awarded during UTC Faculty Honors Day ceremony, November 1989

*Young Engineer of the Year* - awarded by the Chattanooga area engineers during the awards banquet of the Chattanooga area National Engineers Week, February 1989

*Mechanical Engineering Undergraduate Senior Scholarship* - sponsored by duPont, Inc., received at Tennessee Tech University, April 1977

*Mechanical Engineering Undergraduate Junior Scholarship* - sponsored by Fleetguard, Inc., received at Tennessee Tech University, April 1976

### **Professional/Honorary Societies Membership**

Phi Kappa Phi (National University Honor Society)

Tau Beta Pi (National Engineering Honor Society)

Pi Tau Sigma (Mechanical Engineering Honor Fraternity)

Kappa Mu Epsilon (Mathematics Honor Society)

Sigma Xi (National Research Society) - Associate Member – Tennessee Tech - 1979  
Member – UTC - 2004

Omicron Delta Kappa (National Leadership Society)

Order of the Engineer – Tennessee Tech Link

American Society of Mechanical Engineers (1989-present)

UTC Student Section Advisor - 1994 - 2004

IRAC Coordinator - Region XI meeting - 1993

Chattanooga Section Chairman - 1992-1993

Chattanooga Section Vice-Chairman - 1991-1992

Chattanooga Section Treasurer - 1990-1991

National Society of Professional Engineers (1986 – present)  
American Society of Engineering Education (1986 – present)  
Chattanooga Engineers Club (1986 – present)  
Engineer in Training (Tennessee No. 4982)

#### Other organizations

The University of Tennessee Century Club (since 1986 - present)  
National Eagle Scout Association  
Phi Delta Theta Fraternity (social fraternity)  
Order of Omega (Greek honor society)

#### Who's Who Publications

Who's Who in the South and Southwest - 1997/1998 - 25th edition  
Who's Who in America - 1997 - 51st edition  
Who's Who in Science and Engineering – 1996 – 3<sup>rd</sup> edition  
Who's Who Among American Teachers - 1994 - 3rd edition - Volume 1

#### Faculty Development Courses and Sessions

LabVIEW DAQ (Data Acquisition) Course - National Instruments - July 10-11, 1997, Atlanta, Georgia

LabVIEW Basics Course - National Instruments - July 22-24, 1996, Erlanger, Kentucky

Introduction to ANSYS - Swanson Analysis Systems, Inc. - January 15-17, 1990, Impell Corporation, Norcross, Georgia

I have attended the UTC Instructional Excellence Committee Retreat at Watts Bar (and now in Monteagle) in May every year from 1991 to 2005.

I have participated in various instructional sessions (Microsoft Windows, Microsoft Office, HTML, Web-in-a-Box, and Netscape Communicator) sponsored by the Walker Teaching Resource Center.

#### University Committees Served

2004 – 2005 Bookstore Committee  
2004 – 2005 Instructional Excellence Committee  
2003 - 2004 Graduation Committee (ad-hoc)  
2002 – present Commencement Assistant Marshal  
2000 – present Member of the Council of Department Heads  
1999 – 2002 Financial Aid Appeals Committee  
1999 – 2000 SACS Instructional Effectiveness Subcommittee  
1998 – 2000 Classroom Technology  
1995 – 1998 Curriculum Committee  
1994 – 1995 Library Committee  
1991 – 1994 Petitions Committee (Chair: 1992-1994)  
1990 – 1991 Faculty Handbook Committee  
1988 – 1991 UTC Faculty Council representative – Assistant Professor – School of Engineering

## College of Engineering & Computer Science Committees Served

ABET 2000 Accreditation Mechanical Engineering Subcommittee member – 2001-2003  
ABET 2000 Accreditation Sub-Committee - 2001 – 2003  
Engineering Rank & Tenure Sub-Committee to update Rank & Tenure criteria - Chair  
Engineering Dean Search Committee – 1997-1998 – search yielded Dr. Robert Desmond  
Mechanical Engineering Faculty Search – 1998 – search yielded Dr. Rob Bailey  
Civil Engineering Faculty Search – 1998 – Chair – search yielded Dr. Joseph Owino  
Mechanical Engineering Faculty Search – 1997 – search yielded Dr. Ron Goulet  
Research Strategy Task Force  
Computer Applications Committee  
Student Affairs & Recruiting Committee  
Design Review Committee  
Engineer's Week – UTC Engineer's Day Exhibit Coordinator (1987 – 1997)

## Professional Service Activities

1986 – present            *Mathcounts* – a National 7<sup>th</sup> & 8<sup>th</sup> grade math contest – coordinated the Athens, TN site from 1988-1998. Proctored contest at Chattanooga site from 1999-2005

1987 – present            *Order of the Engineer* – Coordinate the Chattanooga Link Order of the Engineer ring ceremony for graduating engineering seniors each Fall and Spring.

1994 – 2004                *American Society of Mechanical Engineers* – Faculty Adviser - UTC student section – (went inactive 1998 – reactivated in 2003)

1991 – 2000                *Society of Women Engineers* – Faculty Advisor – UTC student section – (went inactive 2000)

1986 – 1995                *National Society of Professional Engineers* – Faculty Advisor – UTC student section – (went inactive 1995)

1990 – present            *Tau Beta Pi National Engineering Honor Society* – I am one of four faculty advisors to the Tennessee Zeta Chapter at UTC.

2001 (summer)            *Adventures in Computers, Engineering and Space (ACES)* – a week-long program to encourage 7<sup>th</sup> and 8<sup>th</sup> grade young women to enter the fields of engineering and computer science. I coordinated the Mechanical-Civil Engineering session (two-days)

## Publications, Reports, Presentations

Attributes of a Modern Mechanical Engineering Laboratory, Charles V. Knight and Gary H. McDonald, *for the ASEE Instrumentation Division, Proceedings of the 2005 Annual Meeting of the American Society of Engineering Education*, Portland, Oregon, June 2005

Is the Effort Worthwhile?, Charles V. Knight and Gary H. McDonald, *ASEE Proceedings of the 2005 Southeastern Section Meeting*, Chattanooga, TN, April, 2005

A Modern Undergraduate Mechanical Engineering Laboratory,” Charles V. Knight and Gary H. McDonald, *ASEE Proceedings of the 2001 Southeastern Section Meeting*, Charleston, Charleston, S.C., April, 2001

Renovating a Mechanics of Materials Laboratory using Data Acquisition with LabVIEW, Gary H. McDonald and Charles V. Knight, *ASEE Proceedings of the 2000 Southeastern Section Meeting*, Roanoke, Virginia, April 2000 I gave a twenty minute presentation given to the Mechanical Engineering Unit

Mechanical Engineering 2000 Laboratory Development using Student Design Support, Charles V. Knight and Gary H. McDonald, *ASEE Proceedings of the 1999 Southeastern Section Meeting*, Clemson, South Carolina, April 1999

Modernization of a Mechanical Engineering Laboratory using Data Acquisition with LabVIEW, Charles V. Knight and Gary H. McDonald, *Proceedings of the 1998 Annual Meeting of the American Society of Engineering Education*, Seattle, Washington, June 1998.

A Mechanical Engineering 2000 Laboratory, Charles V. Knight and Gary H. McDonald, *ASEE Proceedings of the 1998 Southeastern Section Meeting*, Orlando, Florida, April 1998.

Data Acquisition Case Study, Charles V. Knight and Gary H. McDonald, *Laboratory Focus – Insights for the Laboratory Professional*, Fall 1997, pp. 5-6.

New Measurements - Data Acquisition Mechanical Engineering Laboratory, Charles V. Knight and Gary H. McDonald, *Virtual Instrumentation in Education Conference Proceedings*, Massachusetts Institute of Technology, Boston, Massachusetts, June 1997.

Modernization of a Mechanical Engineering Laboratory using Data Acquisition with LabVIEW, a poster, Charles V. Knight and Gary H. McDonald, *1997 ASEE Annual Conference and Exposition*, June 15-18, 1997, Milwaukee, Wisconsin.

New Measurements - Data Acquisition Mechanical Engineering Laboratory, Charles V. Knight and Gary H. McDonald, *ASEE Proceedings of the 1997 Southeastern Section Meeting*, Innovative Engineering for the Next Century; April 13-15, 1997, Marietta, Georgia. I gave a twenty minute presentation given to the Mechanical Engineering Unit

Redesign of Flight Space Shuttle Main Engine Nozzle G-15 Seal Area Based on the Thermal Analysis and Flow Models, *NASA/ASEE Summer Faculty Fellowship Report*, NASA CR-184253, NASA/MSFC, Huntsville, Alabama, October 1991. NASA colleague: Joan G. Trolinger. I gave a thirty minute presentation given to NASA Propulsion Lab directors

Freshman Seminar for Engineers, Gary H. McDonald, *ASEE Proceedings of the 1991 Southeastern Section Meeting*, Challenges in Engineering Education; April 14-16, 1991, Charleston, South Carolina. I gave a twenty-five minute presentation given to the Instructional Unit

Thermal Analysis Simulation for a Spin-Motor used in the Advanced Main Combustion Chamber-Vacuum Plasma Spray Project using the SINDA Computer Program, *NASA/ASEE Summer Faculty Fellowship Report*, NASA CR-184044, NASA/MSFC, Huntsville, Alabama, October 1990. NASA colleague: Kathy S. Tygielski. I gave a thirty minute presentation given to NASA Propulsion Lab directors

The University of Tennessee at Chattanooga, an article in *The Bent of Tau Beta Pi*, Spring 1990, pp. 41

Modeling Chattanooga's Historic Walnut Street Bridge in a Mechanics of Materials Design Project, Gary H. McDonald, *ASEE Proceedings of the 1990 Southeastern Section Meeting*, Engineering Education: 20 years -- 20 years Hence; April 8-10, 1990, Charlotte, North Carolina. I gave a twenty-five minute presentation given to the Mechanical Engineering Unit

Videotapes for Engineering Education, Gary H. McDonald and Edwin P. Foster, *ASEE Proceedings of the 1990 Southeastern Section Meeting*, Engineering Education: 20 years -- 20 years Hence; April 8-10, 1990, Charlotte, North Carolina. I gave a twenty-five minute presentation given to the Instructional Unit

The Simulation of the Alternate Turbopump Development High Pressure Oxygen and Fuel Turbopumps for the Space Shuttle Main Engine using the SHABERTH Computer Program, *NASA/ASEE Summer Faculty Fellowship Report*, NASA CR-183553, NASA/MSFC, Huntsville, Alabama, December 1988. NASA Colleague: Henry P. Stinson. I gave a thirty-minute presentation given to the Propulsion Lab directors

The Determination of Equivalent Bearing Loading for the BSMT that simulates SSME High Pressure Oxidizer Turbopump Conditions using the SHABERTH/SINDA Computer Program, *NASA/ASEE Summer Faculty Fellowship Report*, NASA CR-179219, NASA/MSFC, Huntsville, Alabama, November 1987. NASA colleague: Henry P. Stinson I gave a thirty minute presentation given to the Propulsion Lab directors

*Two-Phase, Magnetohydrodynamic, Boundary-Layer Flow and Heat Transfer with Temperature Dependent Transport Properties*, doctoral dissertation, Tennessee Technological University, August 1984 (Dr. Vireshwar Sahai, advisor)

An Approximate Method for Velocity-Sensitive Combustion Instability Problems, Gary H. McDonald and John Peddieson, Department of Engineering Science and Mechanics; paper presented at the *19th Annual Meeting of the Society of Engineering Science, Inc.*, University of Missouri-Rolla, Rolla, Missouri, October 27-29, 1982.

Stability Analysis of a Liquid Fuel Annular Combustion Chamber, Gary H. McDonald, John Peddieson, and Marie Ventrice, NASA CR-159734, NASA Lewis Research Center; R. J. Priem, Technical Monitor, Contract NGR43-003-015, November 1979.

*Stability Analysis of a Liquid Fuel Annular Combustion Chamber*, master's thesis, Tennessee Technological University, August 1979. (Dr. Marie B. Ventrice, advisor; Dr. John Peddieson, co-advisor)

Transient Digital Simulation of a Two Tank Solar Water Heater System, National Science Foundation Undergraduate Research Program Report, August 1977. (Dr. Edwin I. Griggs, advisor)

### **Master Thesis Advised**

I served as the advisor for the following M.S. thesis students:

- Darrell Alan Oakley, M.S. Thesis, *Finite Element Modeling & Parametric Study of the Forming Operation in a Brake Lining Manufacturing Process using ANSYS*, May 2000 (co-advisors Dr. James Hiestand and Dr. Ron Goulet)
- Bradley J. Huhlein; M.S. Thesis, *Kinematic Analysis and Synthesis Modeling for Plate Cam and Follower Systems using TK Solver*, August 1997
- Thada Somphone; M.S. Thesis, *Numerical Modeling of Slideway Hydrostatic Bearings*, August 1992

## Master Thesis Committee Member

I served on the following M.S. thesis committees for the following students:

- Alla H. Abdelhalim, M.S. Thesis; *Analysis of Vibration of a Single Degree of Freedom System using General Forcing Conditions using Maple V*, August 1996, Dr. William Q. Gurley, advisor.
- Ching-Hsiu Wei, M.S. Thesis, *Comparison of the Shear Center of a U-shaped Beam calculated by the Theory of Elasticity and the ANSYS Finite Element Method*, December 1995, Dr. William Q. Gurley, advisor.
- Hsiao-Wei Chang, M.S. Thesis, *Analysis of Two or Three Dimensional Truss Structures by Finite Element Method using Maple V*, November 1996, Dr. William Q. Gurley, advisor.
- Chung-Hao Yen, M.S. Thesis, *Deflections of Reinforced Concrete Beams: Analysis & Design utilizing TK Solver*, August 1996, Dr. Edwin P. Foster, advisor
- Naohito Nakamura, M.S. Thesis, *Column Analysis & Design by the LRFD Specification utilizing TK Solver*, May 1995, Dr. Edwin Q. Foster, advisor.
- Wen-Tzong Li, M.S. Thesis, *Analysis of Straight Beams by Singularity Functions & Fourier Analysis employing Maple V*, April 1995, Dr. William Q. Gurley, advisor.
- Chien-Kai Kuo, M.S. Thesis, *Gable Frame Analysis and Design utilizing TK Solver*, May 1994, Dr. Edwin P. Foster, advisor.
- Bhavin K. Mehta, M.S. Thesis, *Parametric Study of Infinite Beams of Elastic Foundations employing the TK Solver Software Package*, May 1994, Dr. William Q. Gurley, advisor.
- Chien-Kai Kuo, M.S. Thesis, *Gable Frame Analysis & Design utilizing TK Solver*, May 1994, Dr. Edwin P. Foster, advisor.
- Mark W. Brooks, M.S. Thesis, *A Comparison of Stress in Curved Beams with Rectangular Cross Sections calculated by the Winkler-Bach equations, Exact Equations of the Theory of Elasticity and the ANSYS program Finite Element Method*, August 1991, Dr. William Q. Gurley, advisor.
- Bala K. Lagiesetty, M.S. thesis, *Comparison of Stresses between Winkler's Theory and the ANSYS Finite Element Method for Curved Beams with a T-cross section*, April 1991, Dr. William Q. Gurley, advisor.
- Khaled Mourad Sakalla, M.S. Thesis, *Coefficient of Restitution: Measurement and Evaluation*, December 1988, Dr. J. Eric Schonblom, advisor
- Behrooz Ghorbani, M.S. Thesis, *Micro Computer Analysis of Energy Demand of a Building*, May 1986, Dr. Prakash Damshala, advisor

## **Departmental Honors Thesis Committee Member**

I served on the following Departmental Honors Thesis committees for the following students:

- Olin Robert Meeks, *Engineering Design Education: A Foreign Perspective*, June 1996, Dr. Michael H. Jones, advisor
- Peter Hirshman, *Efficient Register Placement in Heating Systems*, June 1995, Dr. James Hiestand, advisor