

**Cumulative Curriculum Vitae Accompanying  
Faculty Activity Report/Self Evaluation**

**Fat Duen Ho**

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**Citizenship Status** U.S. Citizen

**Current Position** Professor of Electrical and Computer Engineering  
The University of Alabama, Huntsville.

**Degrees**

Ph.D.	1976, Southern Illinois University
M.S.E.E.	1971, Southern Illinois University
B.A.	1965, Chu Hai College
B.S.E.E.	1956, South China Technological Institute

**Areas of Competence**

Dr. Ho has been doing research in the areas of microelectronic devices, circuits, and materials. His present research interests focus on microelectronic device modeling for integrated circuit design, nonvolatile semiconductor memories, metal-ferroelectric-semiconductor field effect transistors, ferroelectric nonvolatile memories, digital and analog and RF circuits using ferroelectric devices, RF (radio frequency) MOSFET modeling for wireless communications, and RF circuits for wireless communications. He has been actively involved in the research on digital and analog, and RF circuits using ferroelectric transistors and ferroelectric capacitors.

**EXPERIENCE**

**1991 -present:**

Professor of Electrical and Computer Engineering, Department of Electrical and Computer Engineering, The University of Alabama in Huntsville, Huntsville, Alabama.

**1983-1991:**

Associate Professor of Electrical and Computer Engineering, Department of Electrical and Computer Engineering, The University of Alabama in Huntsville, Huntsville, Alabama.

Was awarded tenure and promoted to Associate Professor of Electrical and Computer Engineering at UAH in 1983.

**1991- 1997**

Professor of Material Science Interdisciplinary Ph.D. Program, University of Alabama in Huntsville, Huntsville, Alabama.

**1988-1991:**

Associate Professor of Material Science Interdisciplinary Ph.D. Program, University of Alabama in Huntsville, Huntsville, Alabama

**1980-1983:**

Assistant Professor of Electrical and Computer Engineering, Department of Electrical and Computer Engineering, The University of Alabama in Huntsville, Huntsville, Alabama.

**1977 -1980:**

Assistant Professor of Electrical Engineering, Department of Electrical Engineering Marquette University, Milwaukee, Wisconsin.

**1976-1977:**

Visiting Assistant Professor of Electrical Engineering, Department of Electrical Sciences and System Engineering, Southern Illinois University, Carbondale, Illinois.

**HONORS AND AWARDS**

1. Outstanding Educator Award for 2005. It was awarded by the Institute of Electrical and Electronics Engineers (IEEE), Huntsville Section.
2. NASA/ASEE Summer Faculty Fellowship, 1987.
3. NASA/ASEE Summer Faculty Fellowship, 1986
4. NASA/ASEE Summer Faculty Fellowship, 1985.
5. Certificates of Recognition awarded by NASA/ASEE for research contribution made through the Summer Faculty Fellowship Program.
6. Marquette University Summer Faculty Fellowship, 1979.

**MEMBERSHIP, SCIENTIFIC AND PROFESSIONAL SOCIETIES**

Life Senior Member of The Institute of Electrical and Electronic Engineers, Inc. (IEEE Senior Member).

**RESEARCH ACTIVITIES**

**PRINCIPAL PUBLICATIONS**

**Journal Papers**

1. M.R. Hunt, C. Mitchell, C.L. McCartney and F. D. Ho, "MFSFET Two-Bit 1T1C DRAM Memory Design and Empirical Data," *Electronics Letters*, **In Press, 2016**.
2. C. Mitchell, M.R. Hunt, C.L. McCartney and F. D. Ho, "Implementation of Low-Power, Non-volatile Latch Utilizing Ferroelectric Transistor," *Electronics Letters*, **5th November 2015, Vol 51, No. 23, pp 1884-1886**.

3. Mitchell Hunt, Crystal L. McCartney, Cody Mitchell, Joseph Evans, Fat D. Ho. "Empirical Data of the Metal-Ferroelectric-Semiconductor Field Effect Transistor Polarization and Channel Resistance for Timing and Retention Analysis." ***Integrated Ferroelectrics* 157.1 (2014): 12-22.**
4. Mitchell Hunt, Rana Sayyah, Cody Mitchell, Crystal L. McCartney, Todd C. MacLeod, Fat D. Ho. "Mathematical Models of the Common-Source and Common-Gate Amplifiers Using a Metal-Ferroelectric-Semiconductor Field Effect Transistor." ***Integrated Ferroelectrics* 157.1 (2014): 81-88.**
5. Mitchell Hunt, Rana Sayyah, Cody Mitchell, Crystal L. McCartney, Todd C. MacLeod, Fat D. Ho, "Extended Characterization of the Common-Source and Common-Gate Amplifiers Using a Metal-Ferroelectric-Semiconductor Field Effect Transistor." ***Integrated Ferroelectrics* 157.1 (2014): 71-80.**
6. Crystal L. McCartney, Cody Mitchell, Mitchell Hunt, and Fat D. Ho. "Design and Testing of a 1T-1C Dynamic Memory Cell Utilizing a Ferroelectric Transistor." ***Integrated Ferroelectrics* 157.1(2014): 1-11.**
7. Cody Mitchell, Crystal L. McCartney, Mitchell Hunt, Fat D. Ho. "Characteristics of a Three-Transistor DRAM Circuit Utilizing a Ferroelectric Transistor." ***Integrated Ferroelectrics* 157.1(2014): 31-38.**
8. Caroline John, Todd MacLeod, Joseph Evans, and Fat D. Ho, "Temperature Effects on a Non-Volatile Memory Device with Ferroelectric Capacitor, ***Integrated Ferroelectrics* 157.1 (2014).**
9. Rana Sayyah, Mitchell Hunt, Fat D. Ho, "A Physically-Derived Nonquasi-Static Model of Ferroelectric Amplifiers for Computer-Aided Device Simulation Part I: the Ferroelectric Common-Drain Amplifier," *Solid-State Electronics*, 2013; 86; 51-57.
10. Rana Sayyah, Mitchell Hunt, Fat D. Ho, "A Physically-Derived Nonquasi-Static Model of Ferroelectric Amplifiers for Computer-Aided Device Simulation Part II: the Ferroelectric Common-Source and Common-Gate Amplifiers", *Solid-State Electronics*, 2013; 86; 58-63.
11. Mitchell Hunt, Rana Sayyah, Todd C. MacLeod, Fat D. Ho, "Expanded-Characterization of the Common-Drain Amplifier Using Metal-Ferroelectric-Semiconductor Field Effect Transistors," *Integrated Ferroelectrics*, 141(01), pp. 134-144, 2013.
12. Mitchell Hunt, Rana Sayyah, Todd C. MacLeod, Fat D. Ho, "A Mathematical model for the Common-Drain Amplifier Using a Metal-Ferroelectric-Semiconductor Field Effect Transistor," *Integrated Ferroelectrics*, 139(01), pp. 106-115, 2012.

13. Crystal Laws McCartney, Cody Mitchell, Mitchell Hunt, Todd C. MacLeod, Fat D. Ho, "I-V Characteristics of a Static Random Access Memory Cell Utilizing Ferroelectric Transistors," *Integrated Ferroelectrics*, 140(01), pp. 35-41, 2012.
14. Caroline S. John, Todd C. MacLeod, Joe Evans and Fat D. Ho, "Retention Analysis of a Non-Volatile Ferroelectric Memory Device", *Journal of Integrated Ferroelectrics*, Vol. 140, No. 1, pp. 23-34, Dec 2012.
15. Scott Wolfson, Fat D. Ho, "Transient Simulation to Analyze Flash Memory Programming Improvements Due to Germanium Content in the Substrate Using Nonquasi-Static Techniques," *Microelectronic Engineering*, Vol. 99, pp. 23-27, 2012.
16. Cody Mitchell, C. Laws, T. MacLeod, Fat D. Ho, "Characteristics of a Nonvolatile SRAM Cell Utilizing a Ferroelectric Transistor," *Integrated Ferroelectrics*, Vol. 132, pp. 82-87, 2012.
17. Caroline John, T. MacLeod, Joe Evans, Fat D. Ho, "Characteristics of an Autonomous Nonvolatile Ferroelectric Memory Latch," *Integrated Ferroelectrics*, Vol. 132, pp. 76-81, 2012.
18. Thomas Phillips, Todd MacLeod, Fat D. Ho, "Modeling of Sonos Memory Cell Erase Cycle," *Integrated Ferroelectrics*, Vol. 132, pp. 70-75, 2012.
19. T. MacLeod, W. Herb Sims, Kosta A. Varnavas, Fat D. Ho, "Results from on-Orbit Testing of the Fram Memory Test Experiment on the Fastsat Micro-Satellite," *Integrated Ferroelectrics*, Vol. 132, pp. 88-98, 2012.
20. Mitchell Hunt, Rana Sayyah, Todd MacLeod, Fat D. Ho, "Characterization of a Common-Gate Amplifier Using Ferroelectric Transistors," *Integrated Ferroelectrics*, Vol. 134, pp. 121-129, 2012.
21. Scott Wolfson, Fat D. Ho, "Flash Program Modeling Using Nonquasi-Static and Tunneling Techniques," *Microelectronic Engineering*, Vol. 96, pp. 40-44, 2012.
22. R. Sayyah, T. MacLeod, Fat D. Ho, "Radiation-Hardened electronics and Ferroelectric Memory for Space Flight Systems," *Ferroelectrics*, 413, pp. 170-175, 2011.
23. Mitchell Hunt, Rana Sayyah, Todd MacLeod, Fat D. Ho, "Characterization of a Common-Source Amplifier Using Ferroelectric Transistors," *Integrated Ferroelectrics*, Vol. 124, pp. 157-166, 2011.
24. R. Sayyah, M. Hunt, T. MacLeod, Fat D. Ho, "Modeling a Common-Source Amplifier Using Ferroelectric Transistors," *Integrated Ferroelectrics*, Vol. 124, pp. 147-156, 2011.
25. T. MacLeod, T. Phillips, Fat D. Ho, "SONOS Nonvolatile Memory Cell Programming Characteristics," *Integrated Ferroelectrics*, Vol. 124, pp. 131-139, 2011.

26. Cody Mitchell, C. Laws, T. MacLeod, Fat D. Ho, "Static Characteristics of the Ferroelectric Transistor Inverter," *Integrated Ferroelectrics*, Vol. 125, pp. 123-129, 2011.
27. C. Laws, C. Mitchell, T. MacLeod, Fat D. Ho, "Switching Characteristics of the Ferroelectric Transistor Inverter," *Integrated Ferroelectrics*, Vol. 125, pp. 141-146, 2011.
28. S. Wolfson, Fat D. Ho, "Temperature Dependent Flash Memory Erase Transient Simulation (Part I)," *Microelectronic Engineering*, vol. 87, 2010.
29. S. Wolson, Fat D. Ho, "Temperature Dependant Flash Memory Erase Transient Simulation (Part II)," *Microelectronic Engineering*, vol. 87, 2010.
30. Scott Wolfson and F.D. Ho, "Transient Simulation to analyze Flash Memory Erase Improvements Due to Germanium Content in the substrate," *IEEE Transactions on Electron Devices*, vol. 57, no. 10, October 2010.
31. R. Sayyah, M. Hunt, T. MacLeod, Fat D. Ho, "A Mathematical Model of a Common-Drain Amplifier Using a Ferroelectric Transistor," *Integrated Ferroelectrics*, June 2010
32. Thomas A. Phillips, Todd C. MacLeod and Fat D. Ho, "Ferroelectric Field-Effect Transistor Differential Amplifier Current Analysis," *Integrated Ferroelectrics*, Vol. 105, pp. 107-117, 2009
33. Rana Sayyah, M. Hunt, T. MacLeod, Fat D. Ho, "An Empirical Study of a FeFET-Based Analog Amplifier," Vol. 107(01), pp. 31-42, 2009.
34. Thomas A. Phillips, Todd C. MacLeod and Fat Duen Ho, "Modeling of a Ferroelectric Field-Effect Transistor Static or Random Access Memory Cell", *Integrated Ferroelectric*, vol. 98, pp. 69-74, 2008.
35. Todd C. MacLeod, Thomas A. Phillips, and Fat Duen Ho, "Characterizing an Analog Amplifier Utilizing a Ferroelectric Transistor (446)," *Integrated Ferroelectrics*, Vol. 104, pp. 40-47, 2008.
36. Todd MacLeod, Thomas A. Phillip and Fat Duen Ho, "Performance Measurement of a Multi-Level/Analog Ferroelectric Memory Device Design," *Integrated Ferroelectrics*, accepted for publication in Vol., 93, 2007.
37. Wolfson and Fat Duen Ho, "Negative-Gate to Substrate Erase Transient Simulation for Flash Memory," *Microelectronic Engineering*, 84, p101-104, 2007.
38. Todd MacLeod, Thomas A. Phillip and Fat Duen Ho, "Design of a Mulit-Level/Analog Ferroelectric Memory Device," *Integrated Ferroelectrics*, Vol. 89, p.12-19, 2007.
39. Thomas Phillips, Todd MacLeod and Fat Duen Ho, "MFSFET NAND Gate Switching Time Analysis," *Integrated Ferroelectrics*, Vol. 89, p. 180-188, 2007.
40. Todd C. MacLeod and Fat Duen Ho, "Ferroelectric Material Application: Modeling Ferroelectric Field Effect Transistor Characteristics from Micro to Nano", *Ferroelectrics*, Vol. 350, pp. 65-74, 2007.

41. Thomas A. Philips, Todd MacLeod and Fat Duen Ho, "Modeling of a Metal-Ferroelectric-Semiconductor Field-Effect Transistor NAND Gate," *Ferroelectrics*, April-May Issue 2006.
42. Todd MacLeod, Thomas A. Phillip and Fat Duen Ho, " Characteristics of Ferroelectric Logic Gates Using a Spice-Based Model," *Ferroelectrics*, April-May Issue 2006.
43. Thomas A. Philips, Mark A. Bailey and Fat Duen Ho, "A Novel Metal-Ferroelectric-Semiconductor Field-Effect Transistor Memory Cell Design," *Integrated Ferroelectrics*, Vol. 67, 229-234, 2004.
44. Todd MacLeod and Fat Duen Ho, "Ferroelectric Field-Effect Transistor Model Using Partitioned Ferroelectric Layer and Partial Polarization," *Integrated Ferroelectrics*, Vol. 64, pp. 89-100, 2004.
45. Todd MacLeod and Fat Duen Ho, "Design of a Ferroelectric Programmable Logic Gate Array," *Integrated Ferroelectrics*, Vol. 56, pp. 1031-1021, 2003.
46. Mark A. Bailey and Fat Duen Ho, "A Metal-Ferroelectric-Semiconductor Field-Effect Transistor Modeling Using a Partitioned Ferroelectric Layer," *Integrated Ferroelectrics*, Vol. 51, 19-37, 2003.
47. Todd MacLeod and Fat Duen Ho, "Simulation Model of a Ferroelectric Field Effect Transistor," *Integrated Ferroelectrics*, Vol. 49, pp. 51-59, 2002.
48. T. C MacLeod and Fat Duen Ho, "Electronic Model of a Ferroelectric Field Effect," *Integrated Ferroelectrics*, Vol. 40, pp. 55-64. 2001.
49. Mark A. Bailey and Fat Duen Ho, "A Drain Current Data Capture System for Metal-Ferroelectric-Semiconductor Field Effect Transistors," *Integrated Ferroelectrics*, Vol. 32, pp. 21-32, 2001.
50. T. C MacLeod and Fat Duen Ho, "I-V Characteristics of a Ferroelectric Field Effect Transistor," *Integrated Ferroelectrics*, Vol. 34, pp.21-16. 2001.
51. Mark A. Bailey and Fat Duen Ho, "An Empirical Ferroelectric Capacitor Model Utilizing a Dual Curve-fit Technique," *Integrated Ferroelectrics*, Vol. 29, pp. 273-282. 2000.
52. Todd C. Macleod and Fat Duen Ho, "Integrating Partial Polarization into a Metal-Ferroelectric-Semiconductor Field Effect Transistor Model," *Integrated Ferroelectrics*, Vol. 27, 1137-1145, 1999.
53. T.C. McLeod and Fat Duen Ho, "Modeling of Metal-Ferro-Electric Semiconductor Field Effect Transistor," *Integrated Ferroelectrics*, Vol. 21, pp.127-143, 1998.
54. Dan Yang, Robert S. Axley, and Fat Duen Ho, "Capacitor Model for a Floating Gate EEPROM Cell," *International Journal of Electronics*, vol. 84, No. 6, pp. 561-581, 1998.

55. John Elmer Asquith, Chang-Ling Sung, Fat Duen Ho, and Chung Bun Chan. "A Two-dimensional Numerical Model of a Floating-Gate EEPROM Transistor," *International Journal of Electronics*, Vol. 85, No6, pp.697-712, 1998.
56. P. Ghazzavi and Fat Duen Ho, "A Numerical Model for MOSFETs from Liquid-Nitrogen Temperature to Room Temperature," *IEEE Transactions on Electron Devices*, Vol. 42, No. 1, pp. 123-134, 1995.
57. M. Doghish and Fat Duen Ho, "A Comprehensive Analytical Model for Metal-Insulator-Semiconductor (MIS) Devices: A Solar Cell Application," *IEEE Transactions on Electron Devices*, Vol. 40, No. 8, pp. 1446-1454, 1993.
58. M. Doghish and Fat Duen Ho, "A Comprehensive Analytical Model for Metal-Insulator-Semiconductor (MIS) devices," *IEEE Transactions on Electron Devices*, Vol. 39, No. 12, pp. 2771-2780, 1992.
59. Fat Duen Ho, "An Analytical Model for Depletion Region Capacitance and Width of Diffused P-N Junctions," *International Journal of Electronics*, Vol. 71, No. pp. 417-438, 1991.
60. Fat Duen Ho, "The Space-Charge Layer Capacitance and the Offset Voltage of an Exponential-Constant P-N Junction," *International Journal of Electronics*, Vol. 70, No. 2, pp. 327- 342, 1991.
61. Fat Duen Ho, "A Simple Model for Space-Charge Region Capacitance of an Exponential-Constant P-N Junction," *Electronics Letters*, Vol. 26, No. 25, pp. 2063-2065, Dec. 6, 1990.
62. Fat Duen Ho, "The Offset Voltage and the Space-Charge Layer Capacitance of a Linearly-Graded P-N Junction and an Abrupt P-N Junction," *International Journal of Electronics*, Vol. 69, No. 2, pp. 247-266, 1990.
63. Fat Duen Ho, "Further Calculation of the  $F^+$ -Center Wave Function for Lithium Niobate," *Physica Status Solidi B*, Vol. 138, No. 2, pp. 693-697, 1986.
64. Fat Duen Ho, "The Improved Point-Ion Potentials for  $LiNbO_3$  and  $LiTaO_3$ ," *Physica Status Solidi B*, Vol. 122, pp. 337-344, 1984.
65. Fat Duen Ho, "Approximate Wave Function for the  $F^+$ -Centers in  $LiNbO_3$  and  $LiTaO_3$ ," *Physica Status Solidi B*, Vol. 115, pp. 229-303, 1983.
66. Fat Duen Ho, " Point-Ion-Lattice Calculations on  $F^+$ -Centers in Lithium Niobate and Lithium Tantalate," *Physica Status Solidi B*, Vol. 114, PP. 202-212, 1982.
67. Fat Duen Ho, "The  $F^+$ -Center in Lithium Tantalate," *Physica Status Solidi B*, Vol. 110, No., 2, pp. 437-443, 1982.

68. Fat Duen Ho, "Electron Energy Levels in Lithium Niobate Resulting from Oxygen Vacancies," *Physica Status Solidi A*, Vol. 66, No. 2, pp. 793-806, 1981.
69. Fat Duen Ho and Frank Sanders, "A Study of Pair Correlation in Three-Electron Atoms," *International Journal of Quantum Chemistry*, Vol. XVII, pp. 619-629, 1980.

### **Paper Abstracts Accepted for Conferences**

Five abstracts were accepted in February 2015 for presentation, four for oral presentations and one for poster presentation, at the 2015 Joint IEEE International Symposium on Applications of Ferroelectrics (ISAF), Integrated functionalities (ISIF), and Piezoresponse Force Microscopy workshop (PRF) (ISAF-ISIF-PFM 2015), taking place from 24 to 27 May in Singapore.

We planned to attend this conference until the plane crash on March 24<sup>th</sup> in the French Alps. Because of the plane crash our families were concerned for our safety. It resulted in our withdrawal of the five presentations. We just mention this here as our activities in this report period. The acceptance emails are attached at the end of this report.

### **Symposium and Conference Papers & Presentations**

1. Crystal L. McCartney, Cody Mitchell, Mitchell Hunt, and Fat D. Ho, "Design and Testing of a 1T-1C Dynamic Memory Cell Utilizing a Ferroelectric Transistor," 2013 ISIF, Grapevine, Texas, July 28-31, 2013.
2. Mitchell R. Hunt, Crystal L. McCartney, Cody Mitchell, Joseph Evans and Fat D. Ho, Empirical Data of the Metal-Ferroelectric-Semiconductor Field Effect Transistor Polarization and Channel Resistance for Timing and Retention Analysis, 2013 ISIF, Grapevine, Texas, July 28-31, 2013.
3. Cody Mitchell, Crystal L. McCartney, Mitchell Hunt and Fat D. Ho, "Characteristics of a Three-Transistor DRAM Circuit Utilizing a Ferroelectric Transistor," 2013 ISIF, Grapevine, Texas, July 28-31, 2013.
4. Mitchell R. Hunt, Rana Sayyah, Cody Mitchell, Crystal L. McCartney, Todd C. MacLeod and Fat D. Ho, "Extended Characterization of the Common-Source and Common-Gate Amplifiers Using a Metal-Ferroelectric-Semiconductor Field Effect Transistor," 2013 ISIF, Grapevine, Texas, July 28-31, 2013.
5. Mitchell R. Hunt, Rana Sayyah, Cody Mitchell, Crystal L. McCartney, Todd C. MacLeod and Fat D. Ho, "Mathematical Models of the Common-Source and Common-Gate Amplifiers Using a Metal-Ferroelectric-Semiconductor Field Effect Transistor," 2013 ISIF, Grapevine, Texas, July 28-31, 2013.
6. Caroline S. John, Todd MacLeod, Fat D. Ho, and Joseph Evans, "Temperature Effects on a Non-Volatile Memory Device with Ferroelectric Capacitor," 2013 ISIF, Grapevine, Texas, July 28-31, 2013.



7. Mitchell R. Hunt, Rana Sayyah, Todd C. MacLeod, Fat D. Ho, "A Mathematical Model for the Common-Drain Amplifier Using a Metal-Ferroelectric-Semiconductor Field Effect Transistor," 2012 ISIF, Hong Kong, June 2012.
8. Mitchell R. Hunt, Rana Sayyah, Todd C. MacLeod, Fat D. Ho, "Expanded Characterization of the Common-Drain Amplifier Using Metal-Ferroelectric-Semiconductor Field Effect Transistors," 2012 ISIF, Hong Kong, June 2012.
9. Crystal Laws McCartney, Cody Mitchell, Mitchell R. Hunt, Todd C. MacLeod, Fat D. Ho, "I-V Characteristics of a Static Random Access Memory Cell," 2012 ISIF, Hong Kong, June 2012.
10. Todd C. MacLeod, Fat D. Ho, et al., "Development of Next Generation Memory Test Experiment for Deployment on a Small Satellite, 2012 ISIF, Hong Kong, June 2012.
11. Caroline S. John, Todd C. MacLeod, Joe Evans, and Fat D. Ho, "Retention analysis of a Non-Volatile Ferroelectric Memory Device," 2012 ISIF, Hong Kong, June 2012
12. Cody Mitchell, C. Laws, T. MacLeod, Fat D. Ho, "Characteristics of a Nonvolatile SRAM Cell Utilizing a Ferroelectric Transistor," International Symposium on Integrated Functionalities (ISIF 2011), Cambridge, England, August 2011.
13. Caroline John, T. MacLeod, Joe Evans, Fat D. Ho, "Characteristics of an Autonomous Nonvolatile Ferroelectric Memory Latch," International Symposium on Integrated Functionalities (ISIF 2011), Cambridge, England, August 2011.
14. Thomas Phillips, Todd MacLeod, Fat D. Ho, "Modeling of SONOS Memory Cell Erase Cycle," International Symposium on Integrated Functionalities (ISIF 2011), Cambridge, England, August 2011.
15. T. MacLeod, W. Herb Sims, Kosta A. Varnavas, Fat D. Ho, "Results from on-Orbit Testing of the Fram Memory Test Experiment on the Fastsat Micro-Satellite," International Symposium on Integrated Functionalities (ISIF 2011), Cambridge, England, August 2011.
16. Mitchell Hunt, Rana Sayyah, Todd MacLeod, Fat D. Ho, "Characterization of a Common-Gate Amplifier Using Ferroelectric Transistors," International symposium on Integrated Functionalities (ISIF 2011), Cambridge, England, August 2011.
17. R. Sayyah, M. Hunt, T. MacLeod, Fat D. Ho, "Modeling a Common-Source Amplifier Using a Ferroelectric Transistor," International Symposium on Integrated Ferroelectrics and Functionalities (ISIF), San Juan, Puerto Rico; June 2010.
18. T. MacLeod, T. Phillips, Fat D. Ho, "SONOS Nonvolatile Memory Cell Programming Characteristics," International Symposium on Integrated Ferroelectrics and Functionalities (ISIF), San Juan, Puerto Rico; June 2010.

19. M. Hunt, R. Sayyah, T. MacLeod, Fat D. Ho, "Characterization of a Common-Source Amplifier Using Ferroelectric Transistors," International Symposium on Integrated Ferroelectrics and Functionalities (ISIF), San Juan, Puerto Rico; June 2010.
20. Cody Mitchell, C. Laws, T. MacLeod, Fat D. Ho, "Static Characteristics of the Ferroelectric Transistor Inverter," International Symposium on Integrated Ferroelectrics and Functionalities (ISIF), San Juan, Puerto Rico; June 2010.
21. C. Laws, C. Mitchell, T. MacLeod, Fat D. Ho, "Switching Characteristics of the Ferroelectric Transistor Inverter," International Symposium on Integrated Ferroelectrics and Functionalities (ISIF), San Juan, Puerto Rico; June 2010.
22. R. Sayyah, M. Hunt, T. MacLeod, Fat D. Ho, "A Mathematical Model of a Simple Amplifier Using a Ferroelectric Transistor," International Symposium on Integrated Ferroelectrics and Functionalities (ISIF2), Colorado Springs, CO; September 28, 2009.
23. T. MacLeod, T. Phillips, R. Sayyah, Fat D. Ho, "Analysis of the Measurement and Modeling of a Digital Inverter Based on a Ferroelectric Transistor," International Symposium on Integrated Ferroelectrics and Functionalities (ISIF2), Colorado Springs, CO; September 28, 2009.
24. T. Phillips, T. MacLeod, R. Sayyah, Fat D. Ho, "Measurement and Analysis of a Ferroelectric Field-Effect Transistor NAND Gate," International Symposium on Integrated Ferroelectrics and Functionalities (ISIF2), Colorado Springs, CO; September 28, 2009.
25. T. MacLeod, W. Sims, K. Varnavas, R. Sayyah, Fat D. Ho, "Satellite Test of Radiation Impact on Ramtron 512K FRAM," Non-Volatile Memory Technology Symposium (NVMTS), Portland, OR; September 2009.
26. Todd C. MacLeod, Thomas A. Philips, and Fat Duen Ho, "Characterizing an Analog Amplifier Utilizing a Ferroelectric Transistor (446)," Presented at the 20<sup>th</sup> *International Symposium on Integrated Ferroelectrics* in Singapore, June 9-12, 2008.
27. Todd C. MacLeod, Thomas A. Philips, and Fat Duen Ho, "Ferroelectric Field-Effect Transistor Differential Amplifier Circuit Analysis (#535)," Presented at the 20<sup>th</sup> *International Symposium on Integrated Ferroelectrics* in Singapore, June 9-12, 2008.
28. Todd C. MacLeod, Thomas A. Philips, and Fat Duen Ho, "Performance Measurement of a Multi-Level/Analog Ferroelectric Memory Device Design," Presented at the 19<sup>th</sup> International Symposium on Integrated Ferroelectrics in Bordeaux, France, May 8-11, 2007.
29. Thomas A. Philips, Todd C. MacLeod, and Fat Duen Ho, "Modeling of Ferroelectric Field-Effect Transistor Static Random Access Memory Cell," Presented at the 19<sup>th</sup> International Symposium on Integrated Ferroelectrics in Bordeaux, France, May 8-11, 2007.
30. Todd C. MacLeod, Thomas A. Philips, and Fat Duen Ho, "Design of a Multi-Level/Analog Ferroelectric Memory Device", Presented at the 18<sup>th</sup> International Symposium on Integrated Ferroelectrics in Honolulu, Hawaii, April 23-27, 2006.
31. Thomas A. Phillips, Todd C. MacLeod, and Fat Duen Ho, "Switching Time Analysis Ferroelectric-Semiconductor Field-Effect Transistor NAND Gate", Presented at the 18<sup>th</sup>

International Symposium on Integrated Ferroelectrics in Honolulu, Hawaii, April 23<sup>rd</sup>-27<sup>th</sup>, 2006.

32. Timothy B. Medley and Fat Duen Ho, "Low Power Adiabatic Field Programmable Gate Array," Accepted for presentation at the 2006 14<sup>th</sup> ACM/SIGDA International Symposium on Field-Programmable Gate Arrays (EPGA 06).
33. Michael Walter Payton and Fat Duen Ho, "Large-Signal Nonquasi-Static MOSFET Model for Computer Aided Device and Circuit Simulation Part I: MOSFETS and CMOS Inverters", Presented at the 2005 IEEE International Symposium on Circuits and Systems, Kobe, Japan, May 23-26, 2005.
34. Michael Walter Payton and Fat Duen Ho, "Large-Signal Nonquasi-Static MOSFET Model for Computer Aided Device and Circuit Simulation Part II: The CMOS NOR Gate and the CMOS NAND Gate", Presented at the 2005 IEEE International Symposium on Circuits and Systems, Kobe, Japan, May 23-26, 2005.
35. Thomas A. Philips, Todd C. MacLeod, and Fat Duen Ho, "Modeling of A Metal-Ferroelectric-Semiconductor Field-Effect Transistor NAND Gate", Presented at the 11<sup>th</sup> International Meeting on Ferroelectricity in Foz do Iguacu, Brazil, Sept 6<sup>th</sup>, 2005.
36. Todd C. MacLeod, Thomas A. Philips, and Fat Duen Ho, "Characteristics of Ferroelectric Logic Gates Using a SPICE-Based Model", Presented at the 11<sup>th</sup> International Meeting on Ferroelectricity in Foz do Iguacu, Brazil, Sept 6<sup>th</sup>, 2005.
37. Barbara Robertson, Fat Duen Ho, and Tracy Hudson, "Modeling and Fabrication of RF MEMS Switches," Was presented at the *2004 International conference on Communications in Computing*, Las Vegas, Nevada, June 21-24, 2004.
38. Todd MacLeod and Fat Duen Ho, "Ferroelectric Field Effect Transistor Model Using Partitioned Ferroelectric Layer and Partial Polarization," presented in the *16<sup>th</sup> International Symposium on Integrated Ferroelectrics*, Gyeongju, South Korea, April 5-8, 2004.
39. Thomas A. Phillips, Fat Duen Ho and Mark Bailey, "A Novel Metal-Ferroelectric-Semiconductor Field-Effect Transistor (MFSET) Memory Cell Design," presented in the *16<sup>th</sup> International Symposium on Integrated Ferroelectrics*, Gyeongju, South Korea, April 5-8, 2004.
40. Frederick Clarke, Fat Duen Ho, Asif Khan, Grigory Simin, J. Yang, Remis Gaska, and Michael S. Shur, "Gate Current and Analytical Modeling in Insulating Gate III – N Heterostructure Field Effect Transistor," *Mat. Res. Soc. Symp. Proc.*, Vol. 743, 2003.
41. Todd MacLeod and Fat Duen Ho, "Design of a Ferroelectric Programmable Logic Gate Array," presented in the *15<sup>th</sup> International Symposium on Integrated Ferroelectrics*, Colorado Springs, March 9-12, 2003.

42. Andrew B. Phillips and Fat Duen Ho, "Potential Charge Balance Model for a Floating Gate EEPROM Cell," *Proceedings of the IEEE International Symposium on Circuit and Systems*, III-783-III-786, 2002.
43. Mark A. Bailey and Fat Duen Ho, "A Metal-Ferroelectric-Semiconductor Field-Effect Transistor Memory Cell," presented in the *International Joint Conference on Applications of Ferroelectrics*, May 27-June 1, 2002, Japan.
44. Todd MacLeod and Fat Duen Ho, "Simulation Model of a Ferroelectric Field Effect Transistor," presented in the *International Joint Conference on Applications of Ferroelectrics*, May 27-June 1, 2002, Japan.
45. Barbara Robertson,\* Fat Duen Ho, Tracy Hudson, "Modeling of RF MEMS Switches," *Proceedings of the SPIE Micromachinery and Microfabrication Conference*, San Francisco, CA, October 21-25, 2001, p. 112-119. ("best student paper" award)
46. T. C MacLeod and Fat Duen Ho, "Electronic Model of a Ferroelectric Field Effect," ABSTRACTS, *13<sup>th</sup> International Symposium on Integrated Ferroelectrics*, Colorado Springs, CO, March 2001.
47. Barbara Robertson, Fat Duen Ho, Tracy Hudson, "Developing Models for the Analysis and Designs of MEMS," *Microsystems Technology and Applications Workshop*, Redstone Arsenal, AL, July 11-12, 2001. (*presented, but did not appear in print*)
48. Mark A. Bailey and Fat Duen Ho, "A Drain Current Data Capture System for Metal-Ferroelectric-Semiconductor Field Effect Transistors," ABSTRACTS, *12<sup>th</sup> International Symposium on Integrated Ferroelectrics*, Aachen, Germany, March 2000.
49. T. C MacLeod and Fat Duen Ho, "I-V Characteristics of a Ferroelectric Field Effect Transistor," ABSTRACTS, *12<sup>th</sup> International Symposium on Integrated Ferroelectrics*, Aachen, Germany, March 2000.
50. T. C MacLeod and Fat Duen Ho, "Integrating Partial Polarization into a Metal-Ferroelectric-Semiconductor Field Effect Transistor Model," ABSTRACTS, *11<sup>th</sup> International Symposium on Integrated Ferroelectrics*, Colorado Springs, CO, March 1999.
51. T. C. MacLeod and Fat Duen Ho, "Modeling of Metal-Ferroelectric-Semiconductor Field Effect Transistors," *Abstracts, 10<sup>th</sup> International Symposium on Integrated Ferroelectrics*, March 1998.
52. Chang-Ling Sung and Fat Duen Ho, "A Finite-Element Approach to the Development of a General Purpose Microelectronic Device Simulator," *Proceedings of the IEEE Southeastcon '95*, PP. 96-98, 1995.

53. Fan Jon Tseng and Fat Duen Ho, "A Numerical Model for BJTs from Liquid-Nitrogen Temperature to Room Temperature," *Proceedings of the IEEE Southeastcon '95*, PP. 96-98, 1995.
54. D. Ghazavi and Fat Duen Ho, "A Two-Dimensional Model at Low Temperature for Buried Channel NMOS," *Proc. of IEEE Southeastcon '93*, Charlotte, NC, April 1993.
55. M. Doghish and Fat Duen Ho, "Numerical Model for Tunneling in MIS Contacts," *Proc. of 23rd Annual Pittsburgh Conf. on Modeling and Simulation*, University of Pittsburgh, Pittsburgh PA, 1992.
56. P. Ghazavi and Fat Duen Ho, "Two-Dimensional MOSFET Device Modeling at Low Temperature," *Proc. of IEEE Southeastcon '92*, Birmingham, AL, 1992.
57. F. Briglia and Fat Duen Ho, "Device Modeling for MOS Transistors at Low Temperature," *Proc. of IEEE Southeastcon '91*, Williamsburg, VA, 1991.
58. Fat Duen Ho and T. Morgan, "SPICE Modeling of Cascade Solar Cells," *Proc. of IEEE Southeastcon '91*, Williamsburg, VA, 1991.
59. Fat Duen Ho and Jong Myong Kim "A Computer Model for SAMOS Structures," *Proc. of University/ Government/ Industry Micro-electronics Symposium*, June 1985.
60. Fat Duen Ho and Jong Myong Kim "Analytical Approximation for Space Charge Layer Capacitance of P-N Junction," *Proc. of the IEEE Southeastcon '84*, pp. 1-3, April 1984.
61. Fat Duen Ho, "Electronic State of the Trapping Center in Barium Titanate," *Proc. of the IEEE Southeastcon '81*, pp. 399-400, April 1981.

## **RESEARCH ACTIVITIES**

### **FUNDED RESEARCH**

1. Principal investigator: Fat Duen Ho  
Grant Account Title: CAN NNM145-21468C Optimization of Ferroelectric Ultra-Capacitor for Energy Storage (NASA/MSFC)  
Period of Performance: 4/1/2015 – 3/31/2016  
Total Award: \$31,996.00
2. Principal investigator: Fat Duen Ho  
Grant Account Title: F/NASA/MSFC/10.13.1/ARES Thermal Development Testing  
Period of performance: 10/01/2009 to 09/30/2011  
Total Award/Value: \$47,880+\$2,120=\$50,000
3. Principal investigator: Fat Duen Ho  
Title: High-Frequency Mixed-Signal Circuit Design  
Agency: PESA Switching Systems Company  
Date Submitted: November 2004

Time Period of Contract: November 15, 2004 to December 31<sup>st</sup> 2005  
Dollar Value: \$29,340.00  
Status: Awarded

4. Principal Investigator: Fat Duen Ho  
Title: High-Frequency Mixed-Signal Circuit Design  
Agency: PESA Switching Systems Company  
Date Submitted: It is going to be submitted in about 1 week  
Time Period of Contract: May 1<sup>st</sup>, 2005 – December 31<sup>st</sup>, 2005  
Dollar Value: \$26,241.00  
Status: This proposal is to request a replacement of funds to the above mentioned contract for the period 5/1/05-12//31/05. Contract was approved and awarded but, modified to end on October 31<sup>st</sup>, 2005 instead of December 31<sup>st</sup>, 2005.
5. Principal Investigator, "Ferroelectric Devices," DoD/US Army Corp. of Engineers, February 98 – October 98.
6. Principal Investigator, "Ferroelectric Capacitor for Nonvolatile Memory Application," U. S. Army Engineer Division, February 1993 - August 1994.
7. Principal Investigator, "Solar Cell Radiation Degradation Analysis," NASA/MSFC, \$17,980.00. Due to cancellation of the AXAF-S program, the fund for this delivery order was deleted. Award/Modification: - \$16,080. (Total Award/Value: \$1,900/\$1,900), August 1993 - August 1994.
8. Obtained outside support for traveling. The trip to Tempe, Arizona for the 8th International Symposium on Integrated Ferroelectrics was funded by Physitron, Inc., Huntsville, Alabama in March 1996.
9. Principal Investigator, "Nonvolatile Ferroelectric Memory," U. S. Army Engineer Division, Awarded in February 1992, Ended in January 1993.
10. Principal Investigator, "Low Temperature Effects on Silicon Microelectronic Devices," U. S. Army Missile Command, ended October 31,1991.
11. Co-Principal Investigator, "Holographic Television," U. S. Army Missile Command, July 1991-March 1992.
12. Principal Investigator, "Study of Large-Area Inversion-Layer Metal-Insulator-Semiconductor (IL/MIS) Solar Cells and Arrays," NASA/ Marshal Space Flight Center Grant, Ended in May 1995.
13. Principal Investigator, "Further Study of Silicon Inversion Layer MOS Solar Cells and Arrays," Marshal Space Flight Center, Grant # NAG8-096, Ended in 1991.
14. Principal Investigator, "Computer Modeling of Inversion Layer MOS Solar Cells and Arrays," Marshal Space Flight Center, Grant # NAG8- 083, Ended in 1990.

15. Principal Investigator, "Analytical P-N Junction Calculation for Semi-conductor-Device Modeling," UAH Mini-Grant Research Program, 1986.
16. Principal Investigator, "SPICE Simulation on Solar Cells," Alabama Solar Energy Center at UAH, 1986.
17. Principal Investigator, "F2 Center in Lithium Niobate," Research Incentive Fund, School of Science and Engineering, UAH, 1982.
18. Principal Investigator, "Electron Trapping States in Barium Titanate," Research Incentive Fund, School of Science and Engineering UAH, 1981.
19. Principal Investigator, "Color Centers in Lithium Tantalate," UAH Research Grant Committee, 1980.
20. Principal Investigator, "Electron Trapping State in Lithium Niobate Resulting from Oxygen Vacancies and Interstitial Positive Ions," Marquette University Summer Faculty Fellowship, 1979.
21. Principal Investigator, "Color Centers and Interstitial Positive Ions in Ferroelectric Photo-Refractive Materials," Marquette University regular Research Grant, 1979.
- 22 Total Award: \$31,996.00. Co-Principal Investigator, "A Required Electrical Engineering Laboratory Course in Microprocessor Applications, ISEP of the National Science Foundation, 1978.

### **OFFICIAL CONSULTING ACTIVITIES**

A consultant to Physitron, Inc., Huntsville, Alabama, since 1994-1999. Worked on contracts for ferroelectric nonvolatile memories for the U.S. Army.

### **THESIS/DISSERTATION DIRECTION**

#### **PH.D. DISSERTATIONS**

1. Rana Sayya  
Dissertation Title: "A Physically Derived Nonquasi-Static Model of the Ferroelectric Transistor for Computer-Aided Device Simulation and Its Application in Analog Circuits." Completed: Spring 2012.
2. Scott Wolfson  
Dissertation Title: "Nonquasi-Static MOSFET model for Digital and Analog Circuit Simulation (tentative)." Expected to complete Fall 2015.
3. Todd MacLeod

Dissertation Title: "Study of Metal-Ferroelectric-Semiconductor Field-effect Transistors and Digital and Analog Circuits (tentative)." Expected to complete Fall 2016.

4. Thomas A. Phillips  
Dissertation Title: "Ferroelectric Nonvolatile Memories (tentative)." Expected to complete Fall 2016.
5. Barbara Robertson  
Dissertation Title: "Radio Frequency (RF) Microelectromechanical Systems (MEMS) Switches." Completed in the Spring Term of 2007.
6. Ming-Hsiung Weng  
Dissertation Title: "Design and Optimization of Deep Sub-micro BICMOS Circuits." Completed September 2000.
7. Chang-Ling Sung  
Dissertation Title: "A Two-Dimensional General Purpose Finite Element Microelectronic Device simulator." Completed February 1996.
8. Parvis Ghazavi  
Dissertation Title: "A Two-Dimensional Model of Metal-Oxide-Semiconductor (MOS) Devices at Low-Temperature for VLSI." Completed May 1994.
9. Mohamed Yehya Soliman Doghish  
Dissertation Title: "Modeling of Metal-Insulator-Semiconductor (MIS) Devices." Completed December 1992.
10. Jong Myong Kim  
Dissertation Title: "Charge Transport and Storage in Floating-Gate Avalanche-Injection Metal-Oxide Semiconductor (FAMOS) Structures." Completed May 1985.

#### **MS THESES**

1. Crystal Dianna Laws, Thesis Title: "Study of the Ferroelectric Inverter and SRAM Cell," Completed: Fall 2012.
2. Michael Cody Mitchell, Thesis Title: "Characterization and Modeling of digital Circuits Using the Ferroelectric Transistor," Completed: Fall 2012.
3. Caroline John, Thesis Title: "Ferroelectric Capacitance Memory: Characterization of an Autonomous Nonvolatile Ferroelectric Memory Latch," Completed: Fall 2012.
4. Mitchell R. Hunt, Thesis Title: "An Empirical Study and Modeling on Selected Analog Circuits Using a Metal Ferroelectric-Semiconductor Field Effect Transistor." Completed: Fall 2011.



5. Rana M. Sayyah, Thesis Title: "Characterization of the Ferroelectric Transistor & its Applications in Analog Circuits." Complete in Fall 2009.
6. Vignesh Subbian, Thesis Title: "Power-Delay Analysis and Optimization Using Self-Bias Transistors in VLSI Circuits." Completed in Fall 2009.
7. Todd MacLeod, Thesis Title: "Study of Metal-Ferroelectric-Semiconductor Field-Effect Transistors and Ferroelectric Logic Gates." Completed in the Summer of 2007.
8. Timothy Medley, Thesis Title: "Field Programmable Gate Array Complex Logic Block in Adiabatic Form." Completed in May 2006.
9. Scott Corey Wolfson Thesis Title: "Flash Memory Cell Program and Erase Transient Modeling." Completed in December 2005.
10. Michael W. Payton, Thesis Title: "A Physically-Derived Large-Signal Nonquasi-Static MOSFET Model for Computer Aided Device & Circuit Simulation." Completed Fall 2003.
11. Thomas A. Phillips, Thesis Title: "Modeling of a Double-Gate Metal Oxide Semiconductor Field Effect Transistor (MOSFET)." Completed Summer 2003.
12. Andrew Brian Phillips, Thesis Title: "Non-Quasi-Static Method for the Computer Aided Design of CMOS Logic Circuits." Completed November 2000.
13. Mark Anthony Darty, Thesis Title: "A Quasi-static Method for the Computer Aided Design of CMOS Logic Circuits." Completed July 1998.
14. Michael E. Futrell, Thesis Title: "An Empirical Study of the Effects of the Read and Write Pulse Width on the Retention of Ferroelectric Materials for Memory Application." Completed May 1993.
15. John Elmer Asquith, Thesis Title: "A Two-Dimensional Numerical Model of An EEPROM Transistor for VLSI." Completed December 1991.
16. Frank Anthony Briglia, Thesis Title: "An Analysis of MOS Planar Device Using One- and Two-Dimensional Models." Completed November 1989.
17. Soon Dal Kwon, Thesis Title: "Two-Dimensional Computer Modeling of N-Channel Metal-Oxide-Semiconductor Devices." Completed May 1987.
18. Julia Xiao-Ping Zhou, Thesis Title: "A Numerical Analysis of Avalanche Breakdown in MOSFET's." Completed March 1987.
19. Timothy D. Morgan, Thesis Title: "A Study of AlGaAs/GaAs Solar Cells." Completed May 1986.

20. Fang-Cheng Yu, Thesis Title: Analysis and Modeling of Nonvolatile Semiconductor Memories." Completed November 1985.
21. Jong Myong Kim, Thesis Title: "Surface Mobility of Semiconductors." Completed May 1982.
22. Chandra Palanichamy, Thesis Title: Nonquasi-Static MOSFET Model for Deep Submicron Device and Circuit Simulation," completed in Spring 2008.
23. Mark Alan Bailey, Thesis Title: A Partition-Based Metal-Ferroelectric-Semiconductor Field-Effect Transistor Model." Completed in Fall 1999.

#### **PLAN II MASTER PROGRAM WITH A TECHNICAL PAPER**

1. Edwin R. Grigorian  
Paper Title: "SPICE Simulation of Eight-Bit Binary Counter." Completed May 1989.

#### **REFEREED JOURNAL REVIEW**

Reviewer for *Cryogenics*  
Reviewer for *International Journal of Electronics*.  
Reviewer for *IEEE Transactions on Electron Devices*  
Reviewer for *IEEE Electron Device Letters*  
Reviewer for *Solid State Electronics*  
Reviewer for *Ferroelectrics*  
Reviewer for *Journal of Electronic Materials*  
Reviewer for *Integrated Ferroelectrics*,  
Reviewer for *EDP Sciences*,  
Reviewer for *Electronics Letters*  
Reviewer for *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*.

#### **TEACHING ACTIVITIES**

##### **DEVELOPMENT OF SPECIALIZATION AREA FOR THE M.S.E. AND PH.D. PROGRAM AT UAH**

- (1) Set up Microelectronics Graduate Program in ECE Department at UAH.
- (2) Was involved in setting up Material Science Interdisciplinary Ph.D. Program at UAH.

##### **COURSE AND LABORATORY DEVELOPMENT**

- (1) Introduced and Developed the following new Electronics courses:
  - (a) EE 738: RF Microelectronics
  - (b) EE739: RF Power Amplifiers

- (c) EE 710: RF Power Amplifiers
  - (d) EE 710: RF Circuits for Wireless Communication
  - (e) EE 710: RF Microelectronics
  - (f) EE 710: Radio Frequency Circuit Design
  - (g) EE 710: High Frequency Integrated Circuits
  - (h) EE 616: Microelectronic Devices and Integrated Circuits
  - (i) EE 617: VLSI Devices
  - (j) EE 716: Device Modeling for Integrated Circuit Design
  - (k) EE 613: Laser Electronics
  - (l) EE 618: VLSI Circuits
  - (m) EE 310: Solid State Fundamentals.
  - (n) EE 516: Digital Electronics  
(This is an old course which has been updated and renovated substantially by me .)
  - (k) EE 620: CMOS Analog Circuit Design  
(Introduced it with Dr. A. Thomsen)
- (2) Updated the digital electronics laboratory by adding more experiments and rearranged old experiments.
- (3) Introduced Computer Aided Design in several courses (EE 416, EE 516, EE 436, EE 616, EE 617, EE 716, and EE 618) by using SPICE (Simulation Program, Integrated Circuit Emphasis) and PR2D Program (The computer-aided design [CAD] software for the integrated circuit layout obtained from NASA/MSFC).
- (4) Planning of Microelectronics Laboratory.

#### **Courses Teaching at UAH (1980-Present)**

- (1) EE 616: Microelectronic Devices and Integrated Circuits
- (2) EE 617: VLSI Devices
- (3) EE 716: Device Modeling for Integrated Circuit Design
- (4) EE 613: Laser Electronics
- (5) EE 516/EE436: Digital Electronics
- (6) EE 504: Electronic Instrumentation
- (7) EE 502: Advanced Logic Circuits
- (8) EE 416: Electronics II
- (9) EE 310: Solid State Fundamentals
- (10) EE 311: Electronic Instrumentation
- (11) EE 300: Electrical Circuits
- (12) EE 618: VLSI Circuits
- (13) EE 620/CPE 625: CMOS Analog Circuit Design
- (14) EE 307: Electricity and Magnetism
- (15) EE 412: Senior Design Projects in Electrical Engineering
- (16) EE 612: Graduate Design Projects in Electrical Engineering
- (17) EE 510: Analog Integrated Circuits
- (18) EE 610: Semiconductor Memories
- (19) EE 610: CMOS RF Design
- (20) EE 610: Nonvolatile Semiconductor Memories

- (21) EE 610: CMOS Mixed Signal Circuit Design
- (22) EE 710: RF MOSFETS
- (23) EE 710: Advanced Semiconductor Memories
- (24) EE 710: Radio Frequency Circuit Design
- (25) EE 710: RF Circuits for Wireless Communication
- (26) EE 710: RF Microelectronics
- (27) EE 615: Analog Circuit Design
- (28) EE 710: High Frequency Integrated Circuits

**Courses Taught at Marquette University (1977 -1980)**

- (1) Digital Electronics (Senior Course)
- (2) Analysis, Design and Application of High Frequency and Optical Electronics (Graduate and senior course).
- (3) Microwave Engineering (Graduate and senior course).
- (4) Experimental Problem Solving I: Instrumentation and Measurement
- (5) Experimental Problem Solving II: Analog Electronics
- (6) Experimental Problem Solving III: Digital Electronics
- (7) Experimental Problem Solving IV: Projects (Senior design course)
- (8) Reading and Research (graduate)
- (9) Laboratory Responsibilities:
- (10) Director of Laboratories in Department of Electrical Engineering:
  - (a) Digital Electronics
  - (b) Analog Electronics
  - (c) Instrumentation and Measurements
  - (d) Projects.

**Courses Taught at Southern Illinois University (1976-1977)**

- (1) Electromagnetic Fields
- (2) Electronics
- (3) Electrical Circuits

**Other Teaching Activities, Short Courses**

- (1) Digital Electronics for NASA/MSFC employees, 1984,1985, 1987.
- (2) Modern Electronics for NASA/MSFC employees, 1988.
- (3) Electronics, George Washington University, Continuing Engineering Education Program, George Washington University, Washington, D.C., 1986.