

CURRICULUM VITAE

James C. (Jim) DeGraffenreid, Ph.D.

OBJECTIVE:

My objective is to continue my work in Physics education, providing excellent service to the university and community and pursuing research opportunities when available and feasible.

EDUCATION

Ph.D. Physics, Arizona State University, Dec. 2007.

M.S. Physics, Arizona State University, Dec. 2007.

M.S. Physics, Texas A&M University, Dec. 1989.

B.S. Physics (minor mathematics), University of Missouri-Columbia, May 1987.

CURRENT POSITION

Instructor, Arizona State University. Aug. 2021 - Present

TEACHING

Arizona State University:

Physics 111 (Lecture – College Physics 1): Instructor, Arizona State University Polytechnic Campus, Mesa, AZ. Aug 2021 – present, Text: *College Physics* by Knight, Jones and Field.

Physics 331 (Lecture – Principles of Modern Electromagnetism): Instructor, Arizona State University Polytechnic Campus, Mesa, AZ. Aug. 2021 – present, Text: *Introduction to Electrodynamics* by Griffiths.

Physics 131 (Lecture – University Physics 1): Instructor, Arizona State University Polytechnic Campus, Mesa, AZ. Aug. 2021 – present, Text: *University Physics* by Freedman and Young.

Physics 112 (Lecture – College Physics 1): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: *College Physics* by Knight, Jones and Field.

Physics 252 (Lab – University Physics 3): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: None.

Physics 131 (Recitation – University Physics 2): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: *University Physics* by Freedman and Young.

Physics 121 (Recitation – University Physics 2): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: *University Physics* by Freedman and Young.

Physics 112 (Recitation – College Physics 2): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: *College Physics* by Knight, Jones and Field.

Physics 132 (Lab – University Physics 2): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: None.

Physics 122 (Lab – University Physics 1): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: *Lab Manual for Physics 122 University Physics I 3ed* by James DeGraffenred, Ghada Elaquad and Lavina Sebastian.

Physics 114 (Lab – College Physics 2): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: None.

Physics 113 (Lab – College Physics 1): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: None.

Physics 111 (Recitation): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: *College Physics* by Knight, Jones and Field.

Physics 101 (Lab – Introduction to Physics): Instructional Professional, Arizona State University Polytechnic Campus, Mesa, AZ. May 2015 – present, Text: None

Maricopa Community Colleges

Physics 111: Adjunct Instructor, Phoenix College, Phoenix, AZ. June 2014 – May 2015, Text: *College Physics* by Serway.

Physics 101: Adjunct Instructor, Phoenix College and Gateway Community College, Phoenix, AZ. August 2013 – May 2015, Text: *Physics of Everyday Phenomena* by Griffiths.

ITT Technical Institute

Conceptual Physics: Adjunct Instructor, ITT Technical Institute, Phoenix, AZ. June 2013 – May 2015, Text: *Conceptual Physics* by Hewett.

Electrical Machines: Adjunct Instructor, ITT Technical Institute, Phoenix, AZ. June 2014, Text: *Electrical Machines* by Hubert.

College Algebra I and II: Adjunct Instructor, ITT Technical Institute, Phoenix, AZ. June 2013 – May 2015, Text: *College Algebra and Trigonometry* by Blitzer.

Microprocessors: Adjunct Instructor, ITT Technical Institute, Phoenix, AZ. June 2013, Text: *Microprocessors and Embedded Systems* by Mazidi.

University of Phoenix

Discrete Mathematics for Information Technology: Undergraduate Faculty, University of Phoenix, Phoenix, AZ. August 2014 – May 2015. Text: *Discrete Mathematics and Its Applications* by Rosen.

Introduction to Finite Mathematics: Undergraduate Faculty, University of Phoenix, Phoenix, AZ. Jan 2014 – May 2015. Text: *Finite Mathematics for Business, Economics, Life Sciences, and Social Sciences* by Rosen.

College Mathematics I and II: Undergraduate Faculty, University of Phoenix, Phoenix, AZ. August 2008 – May 2015, Text: Various.

Astronomy: Undergraduate Faculty, University of Phoenix, Phoenix, AZ. August 2008 – May 2015, Text: *The Cosmic Perspective* by Bennett et al.

Environmental Issues and Ethics: Undergraduate Faculty, University of Phoenix, Phoenix, AZ. August 2008 – May 2015. Texts: *Environmental Ethics: An Introduction* by Light and Rolston. *Environment* by Raven and Berg et al.

Other Institutions

College Mathematics: Adjunct Instructor, Collins College, Tempe, AZ. August 2008 – May 2009, text: *Mathematics: Its Power and Utility* 9th Edition by Smith, K. (10 week semester)

College Algebra: Adjunct Instructor, Collins College, Tempe, AZ. June 2008 – May 2009, text: *Introductory Algebra* 3rd Edition by Bello, Ignacio. (10 week semester)

Foundations of Physics: Adjunct Instructor, Collins College, Tempe, AZ. May 2008 – May 2009, text: *Physics Vol. 1*. 7th Ed. Cutnell J. & Johnson, K. (10 week semester)

College Physics: Teaching Assistant, Texas A&M University. August 1987- May 1989, Responsible for teaching laboratory and recitation sections for algebra- based physics classes.

SERVICE

Service to ASU

Member of University Hearing Board: Fall 2017 – Summer 2021
Member of Residency Appeal Committee: Summer 2016 – present
Student Success Center Physics Tutor: Fall 2015 – present
Member of ASU Green Devils: Fall 2015 – Spring 2016

Service to College

Member of College Grade Appeals Committee: Spring 2018 - present

Service to Department

Member of Faculty Peer Review Committee: Fall 2017 – present

Member of Diversity and Inclusion Committee for CISA's Math and Science : April 2020
- Present

Community Outreach

Judge FFA Competitions : Fall 2015 - Fall 2017

Workshop Leader Jumpstart Program: Fall 2016

Lead for Girl Scout STEM Outreach: October 2016, November 2017, November 2019

Grand Award Judge International Science and Engineering Fair: May 2016, May 2019,
May 2021

ASU Member of Phoenix FanFusion Science Panels

(3 panels) - May 2016

(2 panels) - May 2017

(3 panels) – May 2018

(4 panels) – May 2019

Volunteer ASU Night of the Open Door

Spring 2016

Spring 2017

Spring 2018

Spring 2019

Spring 2020

Spring 2021

Community Service (non-ASU)

Member of Alhambra Village Planning Committee – April 2021 - Present

Member of Finance Council Saints Simon and Jude Cathedral - 2016 – present

Reader at Saints Simon and Jude Cathedral 2014 - 2017

Registered Girl Scout Volunteer – 2009 - present

Awards and Recognition

Excellence in Service and Community Outreach 2018 (Division of Science and Mathematics).

Excellence in Service and Community Outreach 2017 (Division of Science and Mathematics).

Professional Society Memberships

American Association of Physics Teachers 2022 - present

Adjunct Faculty Association Maricopa Community Colleges 2014 – 2015

American Physical Society 2008 - 2011

Materials Research Society 2005 - 2011

American Vacuum Society 1996 - 1997

INDUSTRY EMPLOYMENT EXPERIENCE

Polishing Engineer

May 2009 – January 2013. Sumco Phoenix Corporation, Phoenix, AZ

- Increased productivity of polishing lines by implementing selective polishing weight increases
- Reduced defects by improving slurry filtering and improving wafer rinsing after polishing
- Improved yields by optimizing rinse times after polish

Staff Engineer II

March 2003 - March 2008 STMicroelectronics Inc., Phoenix, AZ

- Responsible for sustaining and improvement projects on 13 Endura PVD systems and Unaxis Clusterline PVD
- Developed backside metal process with lower wafer warpage resulting in significant productivity improvement at wafer test
- Developed a copper seed process for a thick copper ECD layer for use in high power applications
- Started up 5 Endura PVD Systems, including 2 CVD TiN chambers and 1 IMP Ti chamber
- Implemented numerous improvements including: throughput improvement at bond pad cleaning step, qualification of second source vendors for parts
- Worked on cross-functional team to reduce wafer chipping that won a divisional award
- Responsible for statistical analysis of large quantities of data for trend, and problem solving
- Used statistical design of experiments to optimize processes such as back side metal deposition

Vendor Services Manager

April 1999 - March 2003 STMicroelectronics Inc., Phoenix, AZ.

- Responsible for managing on-site vendors running chemical, gas and ultra-pure water operations
- For 18 month period, also responsible for site security and safety organizations
- Qualified numerous second source chemical and gas suppliers resulting in hundreds of thousands of dollars saved
- Provided monthly forecasts of chemical and gas usage
- Streamlined security staffing resulting in hundreds of thousands of dollars saved
- Prepared million dollar annual budgets for above departments (combined)
- Ensured compliance with local, state and federal environmental regulations.
- Ensured compliance with federal customs regulations for foreign trade zones

Staff Engineer-Diffusion/CVD

October 1998-April 1999 STMicroelectronics Inc., Phoenix, AZ

- Responsible for sustaining and improving APCVD systems and vertical furnaces
- Developed models for forecasting chemical usage

Photolithography Engineering Section Manager

April 1997-October 1998 STMicroelectronics Inc., Phoenix, AZ

- Supervised staff of 7 engineers
- Supervised major engineering projects
- Supervised start-up of photo cells
- Introduced deep ultraviolet steppers into production
- Improved throughput of coat/develop tracks
- Planned yearly budget and improvement project for medium term (1-2 year) time frame.

Staff Engineer/Senior Engineer Dielectric and Metal CVD

November 1994-April 1997 STMicroelectronics Inc., Phoenix, AZ.

- Responsible for start-up and sustaining of Watkins-Johnson APCVD Systems, P5000 tungsten and tungsten silicide systems and supporting metrology (FTIR, XRF)
- Developed tungsten CVD and etch back process for x86 microprocessor interconnect

Process Engineer/Intermediate Process Engineer

May 1989-November 1994 National Semiconductor, Arlington, TX

- Start up and sustaining of Novellus dielectric CVD systems
- Start up and sustaining of AMAT P5000 dielectric CVD systems
- Implementation of first in the company in-line parametric test program. Devices were tested after polysilicon deposition and after metal etching
- Programming of Keithley systems for parametric test of CMOS devices.

PUBLICATIONS

Dissertation

DeGraffenreid, J. 2007. Modeling of Heteroepitaxial Growth in One- and Two- Dimensions. Ph.D. Dissertation, Arizona State University.

Peer-Reviewed Publications

DeGraffenreid, J. and J. A. Venables, Heteroepitaxial modeling on strained surfaces using a mean field approach. Computational Materials Design via Multiscale Modeling, edited by Y. Qi, H.E. Fang, N. Reynolds, Z-K. Liu (Mater. Res. Soc. Symp. Proc. Volume 1130E, Warrendale, PA, 2009), 1130-W06-25.

Venables, J. A., J. DeGraffenreid, D. Kay, and P. Yang. 2006. Time-dependent annealing and deposition on substrates with repulsive interactions. *Physical Review B* 74, (7): 075412.

Grima, R., J. DeGraffenreid, and J. A. Venables. Mean-field theory of nucleation and growth on strained surfaces. 2007. *Physical Review B* 76, (23): 233405.

Conference Proceedings

DeGraffenreid J., T. Gandy, A. Sidhwa and B.Y. Mao. Aluminum Interconnect Defectivity Caused by Loss of PVD Chamber Vacuum Integrity. Twenty- Fourth International VLSI/ULSI Multilevel Interconnection Conference September 25-27, 2007.

DeGraffenreid J., N. Slaney, T. Gandy and A. Sidhwa. Development of an Advanced Process Control System for Base Pressure Detection for Endura Metal Deposition Tool. Twenty-Third International VLSI/ULSI Multilevel Interconnection Conference September 26 - 28, 2006.

DeGraffenreid, J., M. Goulding, R. Nickell, T. Gandy and A. Sidhwa. Characterization of the Back Side Metallization Process to Minimize Warp on the Wafers. Twenty -First International VLSI Multilevel Interconnection Conference September 30 - October 2, 2004.

[Philipossian, A.](#), M. Sugiyama, D. [King](#), L. [Charns](#), J. [DeGraffenreid](#), H. [Nguyen-Ngoc](#). Tribological and Removal Rate Characterization of Colloidal Silica ILD CMP Processes. Electrochemical Society Proceedings, v 21, Chemical Mechanical Planarization VI - Proceedings of the International Symposium, 2003, pp. 261-269.

Curtis, T., J. DeGraffenreid, A. Yin. Advanced APCVD BPSG For Sub-Half Micron Applications. DUMIC Conference February 16-17, 1998.

Books:

DeGraffenreid, J. C. et. al. (2019) **Physics 122 Lab Manual 3ed**. Dubuque, IA: KendallHunt.

RESEARCH

Research Interests

My research interests are in computer analysis and modeling of phenomena in materials physics.

RESEARCH EXPERIENCE

Visiting Researcher, Arizona State University

January 2008 – January 2009.

Modeling of heteroepitaxial growth using rate-diffusion equations.

Ph.D Student, Arizona State University

2003-2007

Professor John A. Venables, Advisor

Dissertation: Modeling of Heteroepitaxial Growth in One- and Two- Dimensions

Developed Matlab code to simulate the growth of heteroepitaxial islands under the influence of strain and diffusion anisotropy.

Graduate Assistant, Texas A&M University

1988-1989

Professor Carl Gagliardi, Advisor

Helped to develop FORTRAN code to simulate a scintillation detector and used the code to simulate different conditions in order to optimize detector design.

Undergraduate researcher, University of Missouri Research Reactor

1986

Dr. David Mildner, Supervisor

Worked to transfer and adapt a Monte Carlo neutron scattering simulation written in FORTRAN developed at Argonne National Lab to the University of Missouri Research Reactor.

Professional Meetings Attended

Gordon Research on Thin Film and Crystal Growth, June 24-29, 2007.