

DEPARTMENT OF ENGINEERING
SCIENCE AND MATERIALS

FACULTY ABET INFORMATION

NOVEMBER 2008

AGENDA

En FOLDER



ACCREDITATION PROCESS


What each of us should know

PART I



What is accreditation ?

- In the United States, accreditation is a non-governmental, peer-review process that assures the quality of the postsecondary education students receive.
- Educational institutions or programs volunteer to undergo this review periodically to determine if certain criteria are being met.



What Is ABET Accreditation?

- **ABET** accreditation is assurance that a college or university program meets the quality standards established by the profession for which it prepares its students. For example, an accredited engineering program must meet the quality standards set by the engineering profession.
- **ABET accredits programs only, not degrees, departments, colleges, or institutions**
- **ABET stands for Accreditation Board of Engineering and Technology**



Why Is ABET Accreditation Important?

- Accreditation helps students and their parents choose quality college programs.
- Accreditation enables employers to recruit graduates they know are well-prepared.
- Accreditation is used by registration, licensure, and certification boards to screen applicants.
- Accreditation gives colleges and universities a structured mechanism to assess, evaluate, and improve the quality of their programs.
- Accreditation encourages new and innovative approaches to engineering education



Why Is ABET Accreditation Important?

- Without accreditation our opportunities for **federal funds** for research and education are limited
- Our students will not have the same opportunities to find a competitive job
- Many students could **migrate** to other accredited universities in Puerto Rico such as the Polytechnic University (some of its programs are already accredited)



The ABET Accreditation Process

- Accreditation is a **voluntary process** on the part of an institution. The first step is that an institution request for evaluation of its program(s). (Only programs that have produced at least one graduate are eligible for accreditation.)
- Each program then conducts an internal evaluation and completes a **self-study questionnaire**.



The ABET Accreditation Process

- The self-study documents whether students, curriculum, faculty, administration, facilities, and institutional support meet the established **criteria**.
- While the program conducts its self-examination, the appropriate ABET commission (Engineering) forms an evaluation team to visit the campus.
- A team chair and one or more program evaluators make up the evaluation team.
- Team members are volunteers from academe, government, and industry, as well as private practice.



The ABET Accreditation Process

- During the on-campus visit, the evaluation team reviews course materials, student projects, and sample assignments and interviews students, faculty, and administrators.
- The team investigates whether the criteria are met and tackles any questions raised by the self-study.
- Following its campus visit, the team provides the school with a written report of the evaluation. This allows the program to correct any misrepresentations or errors of fact, as well as address any shortcomings in a timely manner.



The ABET Accreditation Process

- At a large annual meeting of all ABET commission members, the final evaluation report is presented by the evaluation team, along with its recommended accreditation action.
- Based on the findings of the report, the commission members vote on the action, and the school is notified of the decision.



The ABET Accreditation Process

- The information the school receives identifies strengths, concerns, weaknesses, deficiencies, and recommendations for improvements.
- Accreditation is granted for a maximum of six years.
- To renew accreditation, the institution must request another evaluation



Abet Accreditation Criteria 2000

1 - Students	Evaluate, advise, and monitor students and graduates to determine its success in meeting program objectives.
2 - Program Educational Objectives	Each engineering program must have educational objectives consistent with the mission of the institution. There should be a system of ongoing evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the program.
3 - Program Outcomes & Assessment	Each program must have an assessment process with documented results. The outcomes must be relevant to the mission of the institution and the objectives of the program. There are eleven (11) program outcomes (a to k).
4 - Continuous Improvement	
4 - Professional Components (i.e., Curriculum)	The curriculum must prepare students for engineering practice culminating in a major design experience. Must include: (1) one year of college mathematics and basic sciences, (2) one and one-half years of engineering topics and (3) a general education component
5 - Faculty	Faculty is the heart of any educational program. Must be sufficient in number, competent in all areas of the program. Adequate level of student-faculty interaction, professional development, interactions with industrial and professional practitioners. Evaluated by: education, diversity of backgrounds, engineering experience, teaching experience, ability to communicate, enthusiasm, participation in professional societies and registration (PE)
6 - Facilities	Classrooms, laboratories, and associated equipment. Provide atmosphere conducive to learning, foster faculty-student interaction. Availability of modern engineering tools.
7 - Institutional Support & Financial Resources	Resources must be sufficient to attract, retain, and provide for the continued professional development of a well-qualified faculty. Support personnel and institutional services must be adequate to meet program needs.
8 - Program Criteria	Program criteria provide the specificity needed for interpretation of the basic level criteria as applicable to a given discipline. Requirements are limited to the areas of curricular topics and faculty qualifications.
9 - Policies & Procedures	



Program Outcomes Assessment

ENGINEERING PROGRAMS MUST DEMONSTRATE THAT THEIR GRADUATES HAVE

- a - Ability to apply knowledge of mathematics, science, and engineering
- b - Ability to conduct experiments, as well as to analyze and interpret data
- c - Ability to design a system, component, or process to meet desired needs
- d - Ability to function on multidisciplinary teams
- e - Ability to identify, formulate, and solve engineering problems
- f - Understanding of professional and ethical responsibility
- g - Ability to communicate effectively
- h - Broad education necessary to understand the impact of engineering solutions in a global/ societal context
- i - Recognition of the need for and an ability to engage in lifelong learning
- j - Knowledge of contemporary issues
- k - Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice





WHAT HAS ESAM TO DO WITH ABET'S ACCREDITATION ?

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WHAT EACH OF US SHOULD KNOW PART II



WHAT HAS ESAM TO DO WITH ABET'S ACCREDITATION?

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- WE DO NOT HAVE ANY PROGRAM
- WE DO NOT HAVE OUR OWN STUDENTS

But...

remember our

Mission and our Vision





Mission and Vision of ESAM

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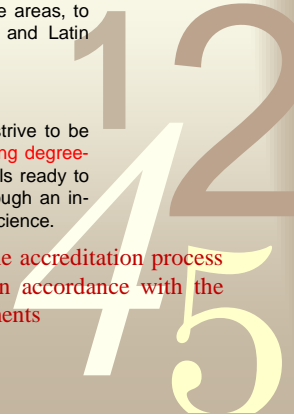
Our Mission:

The mission of the Department of Engineering Science and Materials is to support the engineering degree-granting departments by **teaching fundamental courses in engineering** and related fields and, to develop research in Materials Science and Engineering Education by teaching advanced courses and conducting scientific research in these areas, to serve the communities of Puerto Rico, the United States, and Latin America .

Our Vision:

The Department of Engineering Science and Materials will strive to be the most resourceful department for **supporting the engineering degree-granting departments** and to provide society with professionals ready to help in the solution of challenging engineering problems through an in-depth knowledge in interdisciplinary fields, such as materials science.

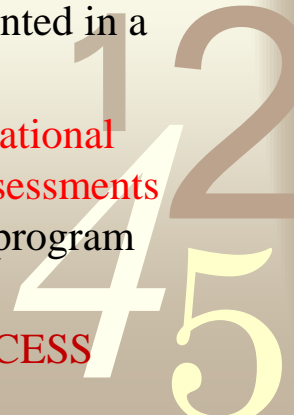
Therefore, ESAM Department must participate in the accreditation process demonstrating that the courses that we teach are in accordance with the educational objectives of the degree-granting departments



The Teaching Improvement Loop

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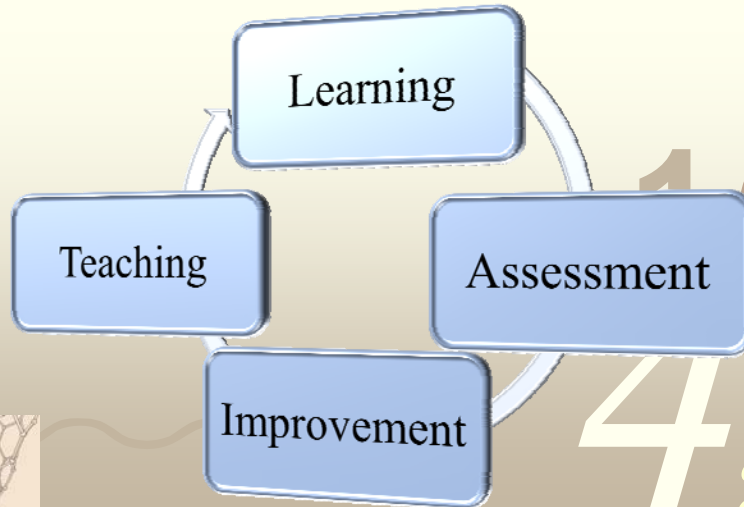
- ABET Criteria is based on what students learn in the course of their program as opposed to what they are presented in a curriculum
- The institution must have **educational objectives** and use **outcome assessments techniques** to determine if the program goals are attained.
- **THIS IS AN ONGOING PROCESS**





The Teaching Improvement Loop

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ESAM'S ABET CRITERIA

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- Educational Objectives
- Course Outcomes and Assessment
- Faculty
- Facilities
- *This are equivalent to criteria 2, 3, 5 and 6 from ABET*

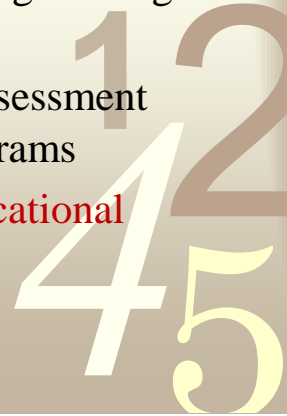




ESAM's Educational Objectives

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- Must constitute the support of the Educational Objectives of all Engineering Programs.
- Engineering science is in the assessment plan of all the engineering programs
- **In 2002 ESAM proposed 5 educational objectives**



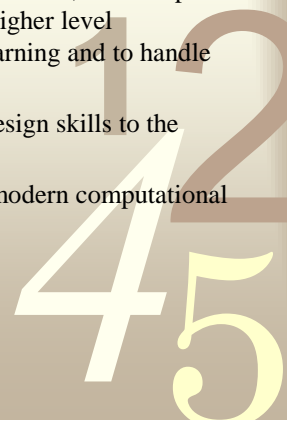
ESAM's Educational Objectives

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1. 2002 FIVE EDUCATIONAL OBJECTIVES

1. The student must develop a solid knowledge of engineering graphics, engineering mechanics, materials science, and computer programming as a foundation to cope with higher level engineering courses, to promote life-long learning and to handle engineering practice.
2. Be capable of applying basic engineering design skills to the solution of engineering problems
3. Prepared to develop algorithms and to use modern computational software for solving engineering problems
4. Have basic skills to work in teams
5. Be aware of engineering ethical standards

2, 3, 4 and 5 are mostly outcomes !



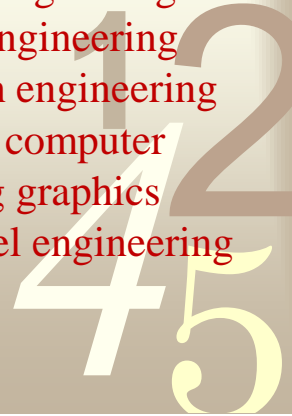


ESAM's Educational Objectives

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Proposed change: 2008 Educational Objective

To provide students from degree-granting departments a foundation in engineering science by teaching courses in engineering mechanics, materials science, computer programming and engineering graphics preparing them for higher level engineering courses.



ESAM's Educational Objectives

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- The Departmental Constituents are:
 - Students
 - Degree-granting engineering departments
 - Faculty





Course Outcomes and Assessment

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- ESAM must have an assessment process with documented results. The outcomes must be relevant to the mission and objectives of the Department .
- There are eleven (11) program outcomes called *a to k*.



1
2
4
5



Course Outcomes and Assessment

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All engineering programs should demonstrate that their students attain:

- A) ability to apply knowledge of math, science and eng.
- B) ability to conduct experiments, analyze and interpret data
- C) **ability to design a system, component, or process to meet desired needs**
- D) function on multi-disciplinary team
- E) **identify, formulate**, and solve engineering problems
- G) communicate effectively
- K) use techniques, skills and modern engineering tools



• **These are the ABET's outcomes that are distributed in all the ESAM courses**

1
2
4
5



Proposed Changes in Outcomes

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- A) ability to apply knowledge of math, science and eng.
 - B) ability to conduct experiments, analyze and interpret data
 - C) **ability to design a system, component, or process to meet desired needs**
 - D) function on multi-disciplinary team
 - E) **identify, formulate**, and solve engineering problems
 - F) **Understanding of professional and ethical responsibility**
 - G) communicate effectively
 - K) use techniques, skills and modern engineering tools
- A) ability to apply knowledge of math, science and eng.
 - B) ability to conduct experiments, analyze and interpret data
 - C) **ability to design a system, component, or process to meet desired needs**
 - D) function on multi-disciplinary team
 - E) solve engineering problems
 - G) communicate effectively
 - K) use techniques, skills and modern engineering tools

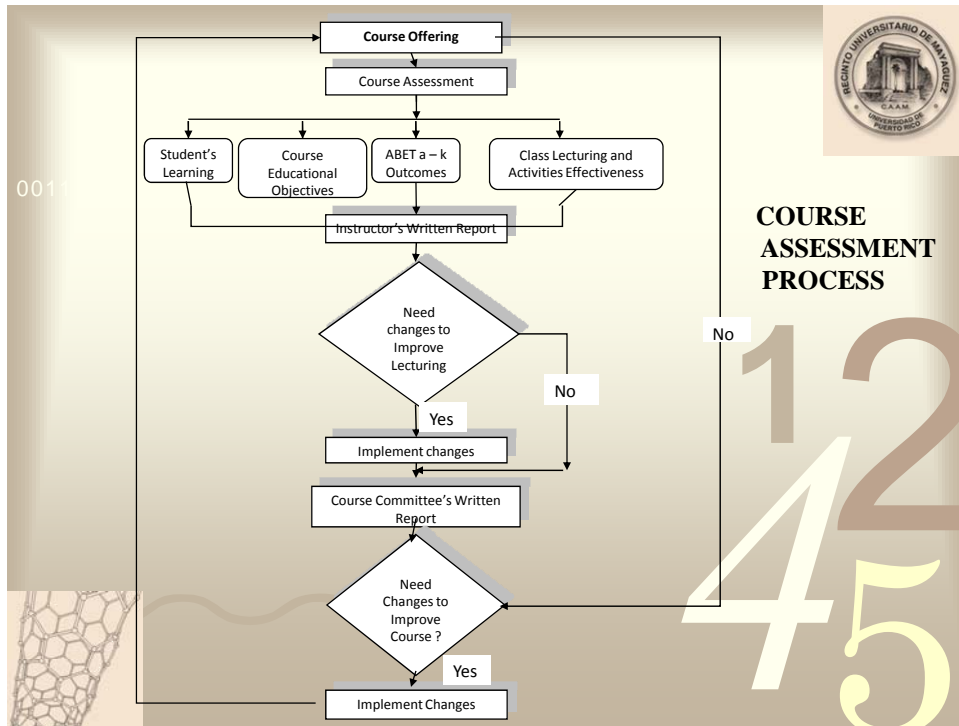


Course Outcomes and Assessment

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- Every faculty member should be applying assessment and **Continuous Improvement**
- **Some prove of assessment must be shown**
- **ESAM should implement a COURSE ASSESSMENT PROCESS**
- **What have we done ?**





- ### What we are doing in course assessment?
- Updating the ESAM Educational Objectives
 - Reviewing the course outcomes for each course according to A to K criteria
 - Filling up a course assessment table for each course to adjust course content if necessary
 - Fill the course evaluation report sheet to propose course improvements
 - The Department prepares a report



ESAM Course Outcomes

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	Revised Outcomes	INGE 3011	INGE 3012	INGE 3016	INGE 3017	INGE 3031	INGE 3032	INGE 3035	INGE 3045	INGE 4001	INGE 4011	INGE 4012	INGE 4015	INGE 4016
a	Ability to apply knowledge of mathematics, science, and engineering	X	X	X		X	X	X	X	X	X	X	X	X
b	Ability to conduct experiments, as well as to analyze and interpret data													X
c	Ability to design a component, or process to meet desired needs				X						X	X	X	
d	Ability to function in teams	X	X		X				X	X			X	X
e	Ability to solve engineering problems			X	X	X	X	X	X	X	X	X	X	X
f	Understanding of professional and ethical responsibility	X			X									
g	Ability to communicate effectively	X	X		X									X
k	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	X		X	X				X	X			X	X



ESAM Course Assessment Table

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Course Outcomes (Items a, e from the a-k)	Exam 1					Exam 2					Exam 3					Exam Final				
	Theory	P1	P2	P3	P4	P1	P2	P3	P4	P5	P1	P2	P3	P5	P4	P1	P2	P3	P4	
Knowledge and understanding of important fluid properties in engineering applications.	x	x	x																x	x
To develop understanding and use analytical tools to solve problems of forces on submerged surfaces.				x	x															x
Kinematics and Dynamics of Fluid Particles: Bernoulli's Eq.							x													x
Understand and apply the fundamental equations of fluids mechanics such as:	System and control volume definitions																			
	Reynolds Transport System																			
	Mass conservation						x													
	Energy Equation										x	x	x	x	x					x
Linear momentum equation								x												
Angular momentum equation									x											
Dimensional Analysis and Similitude										x										
Analysis and design of simple pipe systems											x	x	x	x	x					x
Introduction to turbomachinery											x									
Boundary Layer and Drag Forces (External Flows)																		x	x	
Compressible flow																				



ESAM Faculty

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- Faculty is the heart of any educational program.
- Must be competent in all areas of the program.
- Adequate level of student-faculty interaction, professional development, interactions with industrial and professional practitioners.
- Evaluated by: education, diversity of backgrounds, engineering experience, teaching experience, ability to communicate, enthusiasm, participation in professional societies and registration (PE)



1 2
4 5



What are we doing in ESAM Faculty Evaluation?

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- Requesting Curriculum Vitae in ABET's format
- Fill up professional information form
- The Department provides additional information and prepares a report



1 2
4 5



What are we doing in ESAM's Facilities?

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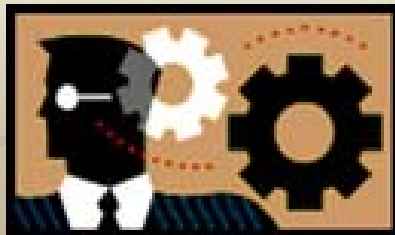
- Several projects are going on since a year ago.
- The Department prepares a report

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**ESAM WILL BE READY
FOR ABET 2008 !**



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DEPARTMENT OF ENGINEERING
SCIENCE AND MATERIALS

FACULTY CURRICULUM VITAE

NOVEMBER 2008

CURRICULUM VITAE

General Information:

Name: José Ramón Arroyo-Caraballo, Ph.D., P.E.

Professor

Institution: University of Puerto Rico, Mayagüez Campus

Address: Engineering Science and Materials Department

PO Box 9044, Mayagüez, PR 00681

Telephone: (787) 832 – 4040 x 3789

Fax: (787) 265 – 3816

E-mail: jrarroyo@uprm.edu

Education:

- Ph.D. in Civil Engineering, University of Puerto Rico, Mayagüez Campus, 1999.
- M.S. in Civil Engineering, University of Puerto Rico, Mayagüez Campus, 1995.
- B.S. in Civil Engineering, University of Puerto Rico, Mayagüez Campus, 1992.

Professional Experience:

- University of Puerto Rico, Mayagüez Campus.
- 2007-present Professor
- 2002-2007 Associate Professor
- 1999-2002 Assistant Professor
- 1995 Instructor
- 1992-1999 Research and Teaching Assistant
- Engineering Research and Development Center, USA Corps of Engineers, Vicksburg Mississippi.
- Summer 2000 (Summer Faculty Research Program, ARMY Research Office)
- Summer 1997 (Graduate Student)
- Summer 1993 (Graduate Student)

States Professionally Licensed:

- Colegio de Ingenieros y Agrimensores de Puerto Rico, Ingeniero Profesional
- Colegiado, Ingeniero inscrito en el Registro Permanente de Agrimensores (1999).

Research Publications and Presentations:

- Velázquez M. and Arroyo J., “Seismic Analysis of Structures with Nonclassically Damping due to Added Linear Viscous Dampers”, VIII SIGMA Xi Student Poster Day, Universidad de Puerto Rico, Mayagüez, April 2003.
- Rivera C., and Arroyo J., “Development of Numerical Model for Barge Impacting a Lock Wall”, VIII SIGMA Xi Student Poster Day, Universidad de Puerto Rico, Mayagüez, April 2003.
- Arroyo J.R., “Application Of The Iterative Method To Calculate The Response Of Shear Buildings With Added Viscous Dampers”, DIMENSION, Revista Del Colegio de Ingenieros y Agrimensores de P.R., Año 18, Vol. 1, 2004.
- Arroyo J.R., “Use of the Canonical Transformation Method to Calculate the Response of Building with Added Viscous Dampers”, DIMENSION, Revista Del Colegio de Ingenieros y Agrimensores de P.R., Año 18, Vol. 2, 2004.
- Arroyo J.R. and Marte R., “Maximum Response of Buildings with Non-Proportional Damping using a Modified Response Spectrum”, DIMENSION, Revista Del Colegio de Ingenieros y Agrimensores de P.R., Año 17, Vol. 3, 2003.

- Arroyo J.R. and Vazquez D., “Response of Shear Building with Added Viscous Dampers Using the Computer Program UPRM-SABADIM”, DIMENSION, Revista Del Colegio de Ingenieros y Agrimensores de P.R., Año 18, Vol. 4, 2004.
- Arroyo J. and Suárez L., “Nonlinear Seismic Response of a Soil Deposit Using the Volterra Series”, Paper presented at the Second MIT Conference on Computational Fluid and Solid Mechanics, MIT, Cambridge MA, June 17-20, 2003.
- Arroyo J. and Suárez L., “Nonlinear Seismic Response of a Soil Deposit Using the Volterra Series”, Presentation at the Second MIT Conference on Computational Fluid and Solid Mechanics, MIT, Cambridge MA, June 17-20, 2003.
- Arroyo J.R., and Marte R., “Maximum response of structures with added viscous dampers subjected to base excitation using a modified response spectrum”, Proceeding of the Earthquake Resistant Engineering Structures IV, WIT Press, 2003.
- Arroyo, J., Ebeling R., and Barker B., “Analysis of Impact Loads from Full-Scale, Low-Velocity, Controlled Barge Impact Experiments, December 1998”, ERDC/ITL TR-03-3, Information Technology Laboratory, Engineer Research and Development Center, US Army Corps of Engineers, Vicksburg, MS, April 2003.
- Arroyo, J., and Ebeling R., “A Numerical Method for Computing Barge Impact Forces Based on Ultimate Strength of the Lashings between Barges”, ERDC/ITL TR-04-2, Information Technology Laboratory, Engineer Research and Development Center, US Army Corps of Engineers, Vicksburg, MS, August 2004.
- Arroyo, J., and Ebeling R., “Barge Train Maximum Impact Forces Using Limit States for the Lashings between Barges”, ERDC/ITL TR-05-1, Information Technology Laboratory, Engineer Research and Development Center, US Army Corps of Engineers, Vicksburg, MS, March 2005.
- Arroyo, J., “Improved Structural Analysis of Buildings with Added Dampers”, Final Report, FEMA – HAZARD MITIGATION GRANT PROGRAM – 1247 – DR – PR – RESEARCH PROJECT – PR – 0060 – C, FEMA, May 2003.
- Arroyo, J., “Mitigation of Seismic Hazard of Reinforced Concrete Residential Structures with Non-rigid Connections”, Final Report, FEMA – HAZARD MITIGATION GRANT PROGRAM – 1372 – DR – PR – RESEARCH PROJECT – PR – 0006, FEMA, July 2005.
- Arroyo J.R. and Vazquez D., “Seismic Evaluation of Reinforced Concrete Residential Structures with Non-rigid Connections, Part I – Vulnerability Analysis”, DIMENSION, Revista Del Colegio de Ingenieros y Agrimensores de P.R., Año 20, Vol. 3, 2006.
- Arroyo J.R. and Vazquez D., “Seismic Evaluation of Reinforced Concrete Residential Structures with Non-rigid Connections, Part II – Connection Analysis”, DIMENSION, Revista Del Colegio de Ingenieros y Agrimensores de P.R., Año 21, Vol 2, 2007.
- Arroyo J.R. and Vazquez D., “Seismic Evaluation of Reinforced Concrete Residential Structures with Non-rigid Connections, Part III – Retrofitting Techniques”, DIMENSION, Revista Del Colegio de Ingenieros y Agrimensores de P.R., Año 22, Vol. 2, 2008.
- Arroyo J.R. and Ebeling R., “Glancing-Blow Impact Forces by a Barge Train on a Lock Approach Wall”, Vol. 12, No. 2, ASCE Journal of Infrastructure Systems, June 2006.
- Arroyo J.R., “Metodología para calcular la respuesta de estructuras con amortiguadores viscosos”, Vol. 4, No. 2, Revista Internacional de Desastres Naturales, Accidentes e Infraestructura Civil, Diciembre 2004.

Membership in Technical and Professional Associations:

- American Society of Civil Engineers, Associate Member (1999), Member (2000).
- Structural Engineering Institute, American Society of Civil Engineers, Member.

Honors and Awards

- Chair of a technical session in the EM2000, Fourteenth Engineering Mechanics Conference, American Society of Civil Engineering, May 2000, held at the University of Texas, Austin, Texas.
- Reviewer of technical papers for the 79th Annual Meeting of the Transportation Research Board, Recent Advances in the Numerical Modeling of Layered Media, sponsored by the A2K05 Committee on Modeling Techniques in Geomechanics and the A2B05 Committee on Strength and Deformation Characteristic of Pavement Sections, Washington, DC, January, 2000.
- *Fellowship for the Second MIT Conference on Computational Fluid and Solid Mechanics* to present and publish the paper Arroyo J. and Suárez L., “Nonlinear Seismic Response of a Soil Deposit Using the Volterra Series”, MIT, Cambridge MA, June 17-20, 2003.

Institutional Service

- Representative of the Graduate School for nine Civil Engineering graduate students.
- President of the graduate committee of two MSCE students.
- Member Departmental Personnel Committee.
- President Departmental Personnel Committee.
- Member Faculty Regulations Committee.
- Member Departmental Engineering Mechanics and Mechanics of Materials Committee.

Time Available for Research and Teaching

- Each semester 9 credits teaching / 3 credits research.

ABET CV for Ivan J. Baiges - Valentin.

1. **Name:** Ivan J. Baiges-Valentin.
2. **Academic rank:** Associate Professor of Engineering Sciences and Materials
3. **Degrees with field, institutions and dates:**
 - a. PhD , Mechanical Engineering - University of Florida, December 1995
 - b. M.S, Mechanical Engineering - Massachusetts Institute of Technology, August 1989
 - c. B.S , Mechanical Engineering - University of Puerto Rico at Mayaguez, June 1986
4. **Number of years service on this faculty:**

Date of original appointment: August 2004
5. **Other related experience:**
 - a. **Hewlett Packard Puerto Rico**, Inkjet Business Unit, R&D Engineer, 1/2001 to 8/2004; in charge of design and manufacturing projects for new products, plastic part design and manufacturing.
 - b. **University of Puerto Rico, Mayagüez Campus**, Assistant Professor, Department of Mechanical Engineering, 1/1996 to 12/2000
 - c. **University of Florida, Research Assistant**, Center for Intelligent Machines and Robotics, Department of Mechanical Engineering, 8/1993 to 12/1995
 - d. **University of Puerto Rico, Mayagüez Campus, Instructor**, Department of Mechanical Engineering, 8/1989 to 6/1993
 - e. **Massachusetts Institute of Technology, Research Assistant**, Eric & Evelyn P. Neumann Laboratory for Biomechanics and Human Rehabilitation, Department of Mechanical Engineering, 9/86 to 7/89
6. **Consulting and patents:**
 - a. Expert witness in the area of product liability, from 1998 to present
 - b. Consultant in Plastic Product Design and Manufacturing for different medical devices companies such as Medtronic, Stryker, Roche Diagnostics, Boston Scientific – from 2004 to present.
 - c. 15 patent submissions and defensive publications while at Hewlett Packard Puerto Rico (some titles are confidential at the moment). Patent numbers - US D526,010 S; US 6,984,014 B2; US 6,955,423 B2; US 5,231,988.
7. **Professional Engineering registration:**

Professional Engineering in the Commonwealth of Puerto Rico
8. **Principal publications:**
 - a. Ivan J. Baiges, “The Design and Implementation of a University Environmental Management System - A tool for teaching Environmental Responsibility”, 9th International Conference on Engineering Education, 2006

- b. Ivan J. Baiges, " Development of a Whole Arm Orthosis for Tremor Suppression", In Proceedings of the 12th Annual RESNA Conference, pages 290 - 91, New Orleans, LA, June 1989.
- c. "The Development of a Whole Arm Orthosis for Abnormal Intentional Tremor Suppression" Mass. Inst. of Technology, M.S.M.E. Thesis, August 1989.
- d. Aisen, ML; Arnold, A; Baiges, I ; Rosen, M . "The Effect of Mechanical Damping Loads on Disabling Action Tremor". Neurology , (1993), 43(7)
- e. "Design of a controlled-energy-dissipation orthosis (CEDO) for the functional suppression of intention tremors", In The Journal of Rehabilitation Research and Development, Vol. 32 No. 1, February 1995 Pages 1-16.

9. Thesis supervised

- a. Juan C. Cruz, "A streamlined life-cycle analysis methodology for the environmental performance evaluation of transportation modes in the San Juan Metropolitan Area", Master of Science in Mechanical engineering thesis, UPR Mayaguez, 2000. Chairman Ivan J. Baiges
- b. Roberto Pastor, "The Effect of High Injection Molding Speed in Polycarbonate Using Universal Molding Procedures", Master of Science in Mechanical engineering thesis, UPR Mayaguez, 2000, Chairman Ivan J. Baiges
- c. Franciso Monroig, "Analysis and Evaluation of the Environmental Performance of Refrigerator' s Life Cycle", Master of Science in Mechanical engineering thesis, UPR Mayaguez, 1999. Chairman Ivan J. Baiges

10. Scientific and Professional Society Memberships

Society of Plastic Engineers
 Colegio de Ingenieros de Puerto Rico
 Puerto Rico Manufacturers Association, Medical Device Cluster

11. Subjects or courses taught at UPR Mayaguez

INGE 3031, *Engineering Mechanics- Statics*, 3 credits
INGE 3045, *Engineering Materials for Electrical Engineering*, 3 credits
INGE 4001, *Engineering Materials*, 3 credits
INGE 4008, *Integrated Approaches to Project Management*, 3 credits
INGE 4011, *Mechanics of Materials I*, 3 credits
INGE 4998, *Undergraduate Research*, 3 credits
INGE 5015, *Theory and Management of Systems*, 3 credits
INGE 5066, *Recycling of Materials*, 3 credits
INGE 5995, *Special Topics: Fundamentals of Engineering Plastics*, 3 credits

12. Institutional and professional service

- a. Development of the UPR Mayaguez Environmental Management System, worked on the creation of the UPRM Office of Environmental Management, February 2005 – to present, full time the summers of 2006, 2007 & 2008.
- b. UPR Mayaguez Pre Engineering Camp, presenter for "Introduction to Engineering", "What is Mechanical Engineering", "Mechanical Engineering Workshop"; Summers 2005, 2006, 2007 & 2008.
- c. School of Engineering, Library Committee
- d. Departmental Committee of Material Sciences and Engineering.
- e. PRMA, Medical Device Cluster Educational Committee.

13. Professional development, presentations and service activities:

- a. Attended ISO 14000 EMS Lead Auditor Course, July 2005
- b. Instructor for short courses –
 - ✓ “Introduction to the Analysis and Design of Automatic Control Systems”, CIAPR Dec 2004
 - ✓ “*Understanding Plastics*”, CIAPR, July 2007
 - ✓ “*Fundamentals of Design for Manufacturing*”, CIAPR July 2007
- c. Puerto Rico Medical Device Conference, Presentations
 - ✓ “*Design Transfer: A DFMA Approach*”, February 2006
 - ✓ “*Best Practices for Product Transfer: Enhancing Process Understanding and Simplifying Compliance*”, February 2007
 - ✓ “*Knowledge Management as a Strategy for Becoming more Competitive- How Stryker Puerto Rico started their KM Program*”, February 2008

Megh R. Goyal, Ph. D., P.E.

Professor

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E-Mail: m_goyal@ece.uprm.edu

Professional Preparation

- Ph.D. (Engineering), The Ohio State University, 1979
- M.Sc. (Engineering), The Ohio State University, 1977
- B.Sc. (Engineering) Punjab Agric. University (India), 1971

Professional Experience

- 2002-2003, Visiting Professor in Biomedical Engineering, Florida International University, Miami, FL.
- 1988-Present, Professor, University of Puerto Rico, Mayagüez Campus.
- 1983-1988, Associate Professor, University of Puerto Rico, Mayagüez Campus.
- 1979-1983, Assistant Professor, University of Puerto Rico, Mayagüez Campus

Other Related Experience

- 1979, Post Doc- Res. Assoc., The Ohio State University.
- 1976-1979, Res. Associate, The Ohio State University.
- 1972-1975, Lecturer, Haryana Agric. University, India.

Professional Affiliation: States in which professionally Certified

- Professional Engineer, College of Engineers & Surveyors of PR, 1986
- AMIE (Eng.) Institution of Engineers (India), Calcutta, 1974

Principal Publications and Presentations

- Goyal, Megh R., Editor. 2003. Biofluid Dynamics of Human Body Systems. Conference Proceedings by Biomedical Engineering Department at Florida International University. ecopy at: <http://faculty.eng.fiu.edu/~mgoyal/>
- Goyal, Megh R., Editor, 2004. Proceedings of the congress on: Engineering Biomechanics: Statics & Dynamics. University of Puerto Rico – Mayaguez Campes. Ecopy at < <http://academic.uprm.edu/~mgoyal/biomechanics.htm>>
- Goyal, Megh R. 2005. Water consumption by selected crops and climatology: Case study in Trinidad. Corporación Universitaria Santa Rosa de Cabal [UNISARC], Colombia. Boletín: Investigaciones de UNISARC, Volumen 4 No 1, paginas 1-18. enero
- Goyal, Megh R. 2006. Advances in Biofluid Mechanics of Human Body. Invited paper at 2006 Medical Device Conference in San Juan – PR. February
- Goyal, Megh R. and Victor H. Ramirez - Builes. 2007. Elements of Agroclimatology [Spanish]. Chapters 1 – 9. Pages 1- 389. Universitaria Santa Rosa de Cabal [UNISARC], Colombia. Mayo de 2007. <http://www.ece.uprm.edu/~m_goyal/agroclimatologia.pdf>
- Goyal. Megh R. 2006. Agricultural and Biomedical Engineering: Scope and Opportunities. Conference Paper at 24th Annual Meeting of ASABE – Puerto Rico Section, and at 4th LACCEI conference in PR at UPRM on June 18-22.

- Goyal, Megh R Goyal and S. F. Shih, 2007. Generation of missing climatic data in Puerto Rico. Corporación Universitaria Santa Rosa de Cabal [UNISARC], Colombia. Boletín: Investigaciones de UNISARC, Volumen 5 No 1, paginas 1-11. enero
- Goyal, Megh R. y Víctor H. Ramírez. 2006. Manejo de Riego Por Goteo. Capítulos 1–21. Páginas 1- 589. Universitaria Santa Rosa de Cabal [UNISARC], Colombia. Dic 2006.
- Goyal, Megh R. y Víctor H. Ramírez. 2006. *Manejo de Riego Por Goteo*. Capítulos 1–21. Páginas 1- 589. Universitaria Santa Rosa de Cabal [UNISARC], Colombia. Aceptado para publicación.
“La versión en español, julio/diciembre 2006”
<http://www.ece.uprm.edu/~m_goyal/dripirrigation.htm>
“English version, April 2007: *Management of Drip/ Micro or Trickle Irrigation*”
<http://www.ece.uprm.edu/~m_goyal/microirrigation.htm>
- Goyal, Megh R., 2007. *Innovations in Science & Technology: Year 2107*. Paper 2007-03 at San Juan – PR at Annual Meeting of PR Section of American Society of Agric. & Biological Engrs.
<http://asae.frymulti.com/section_meeting.asp?confid=smppr>
For complete list is available at: http://www.ece.uprm.edu/~m_goyal/publication.htm
http://www.ece.uprm.edu/~m_goyal/home.htm

<http://academic.uprm.edu/~mgoyal/biomechanics.htm>

http://www.ece.uprm.edu/~m_goyal/microirrigation.htm

Scientific and Professional Societies of Which a member

- 2002 – Associate Member, Biomedical Engineering Society
- 1985 -- Life member, Caribbean Studies Association
- 1982 -- Member, College of Engineers & Surveyors of Puerto Rico
- 1982 -- Life member, US Committee of ICID
- 1979 -- Life member, American Society of Agricultural & Biological Engineers
- 1979 -- Member, Honor Society of Gamma Sigma Delta
- 1979 -- Member, Honor Society of Alpha

Honors and Awards

- 1981 Puerto Rican Society of Agricultural Sciences (SOPCA) Scientist of the Year
- 1983 Am. Soc. Agric. Engrs. (ASAE) Blue Ribbon Award
- 1983 Am. Soc. Agric. Engrs. (ASAE) Research Paper Award
- 1986 Am. Soc. Agric. Engrs. (ASAE) Blue Ribbon Award.
- 1987 Am. Soc. Agric. Engrs. (ASAE) Nolan Mitchell Young Extension Worker Award
- 1989 Am. Soc. Agric. Engrs. (ASAE): Puerto Rico Section Agricultural Engineer of the Year
- 1989 Gamma Sigma Delta UPR-Mayagüez Research Scientist of the Year
- 1989 Mayor of Juana Díaz - PR, January 18. Citation
- 1991 Mayor of Ponce - PR, March 19 Citation

- 1991 Am. Soc. Agric. Engrs. (ASAE) Blue Ribbon Award
- 1992 Am. Soc. Agric. Engrs. (ASAE) Membership campaign winner of ASAE: Grand Prize.
- 2001 University of Puerto Rico: July Dedication of First BIOFLUID MECHANICS Congress
- 2005 Am. Soc. Agric. Engrs. (ASAE): Puerto Rico Section Father of Irrigation Engineering in Puerto Rico
- 2006 Mayor of Municipality of Moca – Puerto Rico Adopted son of Moca: April 20
- 2006 University of Puerto Rico – Mayaguez: Graduate School, Irrigation Protagonist for June
- 2007 Mayor of Municipality of Caguas/ Ponce/ Mayaguez – Puerto Rico and Senate of Puerto Rico: April 2. Proclaimed “Man of Drip Irrigation Technology in Puerto Rico”.
- Teaching Excellence Award by Faculty of Engineering, May 2008.

Percentage of Time Available for Research and Scholarly Activities

- Hundred percent teaching.

Percentage of Time Committed to the Program

- Hundred percent teaching.

Curriculum Vitae

Name

Miguel Cruz Arocho

Academic Rank

Professor

Education

BS in Civil Engineering, University of Puerto Rico, 1972

MS in Civil Engineering, University of Puerto Rico, 1975

MS in Environmental Engineering, Georgia Tech, 1977

Number of years of service

34

Instructor: August 1974 – June 1982

Assistant Professor: July 1982 – June 1987

Associate Professor: July 1987 – June 1993

Professor: July 1993 – Present

Other related experience

Instructor for the last 25 years of the Fundamental Exam License Review Course of the Association of Engineers and Surveyors of Puerto Rico, San Juan, PR.

Consulting

Professional Consulting in the areas of Environmental, Structures and Surveying to the general public and to Municipalities of Puerto Rico for the last 20 years.

States in which professionally licensed:

Puerto Rico: Professional Engineer, Lic. 6581

Real Estate Broker, Lic. 2052

Principal publications of last five years

None

Membership in scientific and professional societies

Association of Engineers and Surveyors of Puerto Rico

Honors and Awards

Selected as Distinguished Member of the Association of Engineers and Surveyors, Aguadilla Chapter, 1994

Institutional and Professional service for the last five years

Associate Director of General Engineering during two periods: February 2001 – August 2004 and November 1987 – February 1989.

Member of the Departmental Fluids Mechanics Committee, 2004 – present

Coordinator of the Departmental Applied Mechanics and Strength of Materials Committee, 2005 – present

Member of the Faculty of Engineering Academic Affairs Committee: 2006- present

Percentage of time available for research

None

Percentage of time available to the program

100 percent

Yang Li, Ph. D.
Assistant Professor
Department of Engineering Science and Materials
University of Puerto Rico at Mayaguez
Mayaguez, PR 00681-9044, USA

Experience

Assistant Professor

August 2006 - present

Department of Engineering Science and Materials, University of Puerto Rico, Mayaguez
Campus

Research Assistant Professor

July 2005 – July 2006

Department of Physics, University of Texas at Arlington

Postdoctoral Research Associate and Teaching Staff

June 2001 – July 2005

Department of Physics, Texas A&M University, College Station, TX

Postdoctoral Research Associate (Royal Society Fellowship)

May 1999 – May 2000

The Blackett Laboratory, Department of Physics, Imperial College, London, UK

Education

Ph. D. (Materials physics), Department of Materials Physics, University of Science and
Technology Beijing,. (March, 1993)

MS (Materials physics), Department of Materials Physics, University of Science and
Technology Beijing
(December, 1989).

BS (physics), Department of Materials Physics, University of Science and Technology
Beijing. (July, 1984)

Grant Proposals

- PI, proposal “*Acquisition of a Cryogen-Free Physical Property Measurement System for Research and Education at University of Puerto Rico at Mayaguez*” NSF MRI (Grand No. DMR- 0821284, 2008).
- Co-PI, proposal “*A Research and Education Thermomechanometry Hub at UPRM*”, DoD HBCU-ISP, (Grand No.52648-RT-ISP, 2006).
- PI, Proposal “*Magnetism in Si-, Ge- and Sn-based clathrates: New nanostructured magnetic materials*”, (CID Program UPRM, Project No. SM-07-14, 2006).
- Co-PI, proposal: “*Advanced DNA Microarray Technologies based on Homologous Strand Exchange and Magnetic Nanomanipulation*” UTD-UTA Joint Institutional Research Program (Grant No. 06443, 2006).

Service

- Editorial Advisory Board Member of *Open Condensed Matter Physics Journal* (March 2007 – present).

- Referee for *J. Mater. Res.*, *Physica C*, *J. Appl. Phys.*, *Appl. Phys. Lett.*, *Phys. Rev. B*, *IEEE transactions*, *J. MMM*, *Chin. Phys. Lett.*, *Acta Physica Sinica*, *J. Chin. Rare Earth Soc.*, and *J. Industrial and Management Optimization*.

Publications

Journal Articles (Selected recently important papers from 114 peer-reviewed journal publications)

- [1] **Yang Li**, R. H. Zhang, Y. Liu, N. Chen, Z. P. Luo, X.Q. Ma, G. H. Cao, Z. S. Feng, Chien Hu and Joseph H. Ross, Jr. "Superconductivity in gallium-substituted Ba₈Si₄₆ clathrates", *Phys. Rev. B* **75**, 054513(2007).
- [2] **Yang Li**, J. Gao, N. Chen, Y. Liu, Z.P. Luo, R.H. Zhang, et al, "Electronic structure and physical properties of Ba₈Ga₁₆Sn₃₀ clathrates with type-I and type-VIII structure" *Physica B* **403** 1140 (2008).
- [3] Y.P. Wang, **Yang Li**, C.B. Rong and J.P. Liu, "Sm–Co hard magnetic nanoparticles prepared by surfactant-assisted ball milling", *Nanotechnology* **18**, 465701 (2007).
- [4] C.G. Hu, **Yang Li**, J.P. Liu, Y.Y. Zhang, G. Bao, B. Buchine, Z.L. Wang, "Sonochemical synthesis of ferromagnetic core–shell Fe₃O₄–FeP nanoparticles and FeP nanoshells", *Chemical Physics Letters* **428**, 343 (2006).
- [5] **Yang Li**, Y. Liu, N. Chen, G.H. Cao, Z.S. Feng, J.H. Ross, Jr., "Vacancy and Copper-doping effect on superconductivity for clathrate materials" *Phys. Lett.* **A345**, 398 (2005).
- [6] W.P. Gou, **Yang Li**, Ji Chi, Joseph H. Ross, Jr., M. Beekman, and G. S. Nolas, "NMR Study of Slow Atomic Motion in Sr₈Ga₁₆Ge₃₀ Clathrate", *Phys. Rev. B* **71**, 174307 (2005).
- [7] J. Chi, **Yang Li**, F. G. Vagizov, Venkatesh Goruganti, and Joseph H. Ross, Jr., "NMR and Mossbauer study of FeAl₂" *Phys. Rev. B* **71**, 024431 (2005).
- [8] D.Y. Kong, **Yang Li**, X. Ouyang, A.V. Prosvirin, H.H. Zhao, J.H. Ross, Jr., K.R. Dunbar, and A. Clearfield, "Syntheses, Structure, and Magnetic Properties of New Types of Cu(II), Co(II), and Mn(II) Organophosphonate Materials: Three-Dimensional Frameworks and a One-Dimensional Chain Motif," *Chem. Mater.*, **16**, 3020-3031 (2004).
- [9] **Yang Li** and J. H. Ross, Jr., "Ferromagnetism in Fe-doped Ba₆Ge₂₅ chiral clathrate", *Appl. Phys. Lett.* **83**, 2868-70 (2003).
- [10] **Yang Li**, J. Chi, W.P. Gou, S. Khandekar and J. H. Ross, Jr, "Structure and stability of Ba-Cu-Ge type-I clathrates", *J. Phys.:Condens. Matter* **15**, 5535-5542 (2003).
- [11] **Yang Li** and Joseph H. Ross, Jr., "Superconductivity at 10 K in (Ge-Ba)-based compounds", *IEEE Transactions on Applied superconductivity*, **13**(2) 3047-3050 (2003).
- [12] D. Y. Kong, **Yang Li**, J.H. Ross Jr. and A. Clearfield, "A novel copper organophosphonate with a pore-like 3D framework and Cu–Cu magnetic ordering", *Chem. Commun.* 1720-1721 (2003).
- [13] C.B Rong, **Yang Li**, and J. P. Li, "Curie temperatures of annealed FePt nanoparticle systems" *J. Appl. Phys.* **101**, 09K505 (2007)
- [14] N. Chen, L.G. Zhang, **Yang Li**, "Spin Distributions on CaCuO₂ Cuprate High-Tc Superconductor", *Physica B* **403** 1142(2008).
- [15] Ji Chi, **Yang Li**, Weiping Gou, V. Goruganti, K. D. D. Rathnayaka, Joseph H. Ross, "Kondo lattice behavior and magnetic field effects in Al₂₀V₂Eu", *Physica B* **403** 1426 (2008).
- [16] V. Goruganti, **Yang Li**, J.H. Ross, Jr., Y. Oner, "Magnetic and Transport Properties of Nd₂Ni₂Pb" *J. Appl. Phys.* **99**, 08P303 (2006).
- [17] Z.S. Feng and **Yang Li**, "Traveling wave solutions to the Fisher equation", *Physica A* **366**,

115 (2006).

- [18] V. M. Chakka, B. Altuncevahir, Z. Q. Jin, **Yang Li**, J. P. Liu, "Magnetic Nanoparticles Produced By Surfactant-Assisted Ball Milling" *J. Appl. Phys.* 99, 08E912 (2006).
- [19] **Yang Li**, W.P. Gou, Ji Chi, V. Goruganti, and J.H. Ross, Jr. "Transition-Metal Substitution in Semiconducting $\text{Ba}_8\text{Ga}_{16}\text{Ge}_{30}$ Clathrates, *Physics of semiconductors*, (ed. J. Menendez and C. Van de Walle) AIP Conf. Proc. 772, 331 (2005).
- [20] A. Wang, G. Cao, Y. Liu, Y. Long, **Yang Li**, Z. Feng and J.H. Ross, Jr., "Magnetic entropy change of the layered perovskites $\text{La}_{2-2x}\text{Sr}_{1+2x}\text{Mn}_2\text{O}_7$ ", *J. Appl. Phys.* 97, 103906 (2005).
- [21] **Yang Li**, Y. Liu, R. F. Duan, X. T. Xiong, B. Y. Wang, G. H. Cao, L. Wei, D. N. Zheng, Z. X. Zhao, and J. H. Ross, Jr., "Positron annihilation study of the O-T phase transition for $\text{Eu}_{1+x}\text{Ba}_{2-x}\text{Cu}_3\text{O}_{7-y}$ superconductors". *Physica C* 402 179-187 (2004).
- [22] Z.P. Luo, **Yang Li**, H. Hashimoto, H. Ihara, A. Iyo, K. Tokiwa, J.A. Larrea J., and E. Baggio-Saitovitch, "Defective Structure in the high-Tc Superconductor Hg-1234", *Physica C* 408 50 (2004).
- [23] **Yang Li** and J.H. Ross, Jr., "New transition-metal doped germanium clathrates", *Material Research Soc. Symp. Proc. Vol. 793* © 2004 Materials Research Society, S7.3.1-6 (2004).
- [24] **Yang Li**, J. H. Ross, Jr., J. A. Larrea J. and Elisa Baggio-Saitovitch, "Study of superconducting Ba-Ge-Co compounds" *Physica C* 408 867 (2004).
- [25] **Yang Li**, Z.G. Yin, Y. Wang, G.H. Cao, J.H. Ross Jr., A.D. Caplin, G. Perkins, B.Y. Wang, and L. Wei, "Flux Pinning Behavior and Positron Annihilation Study on (Pb,Sn)-Doped Bi-2212 Superconductors", *Material Research Soc. Symp. Proc. Vol. EXS-3* © 2004 Materials Research Society, EE8.33 (2004).
- [26] A. Mondal, **Yang Li**, M.A. Khan, J.H. Ross, Jr., and R.P. Houser, "Supramolecular Copper Hydroxide Tennis Balls: Self-Assembly, Structures, and Magnetic Properties of Octanuclear $[\text{Cu}_8\text{L}_8(\text{OH})_4]^{4+}$ Clusters (HL= N-(2-Pyridylmethyl)acetamide)" *Inorganic Chemistry* 43 7075-7082 (2004).
- [27] C. S. Lue, **Yang Li**, and J.H. Ross, Jr. and G.M. Irwin, "NMR and Mössbauer study of spin dynamics and electronic structure of $\text{Fe}_{2+x}\text{V}_{1-x}\text{Al}$ and Fe_2VGa ", *Phys. Rev.* B67, 224425 (2003).
- [28] Z. G. Yin, **Yang Li**, X. T. Xiong, Y. Liu, G. H. Cao, J. H. Ross, Jr., "Preparation and properties of (Y,Eu)-123 superconducting single crystals", *Physica C* 390 254-262 (2003).

Name
Agnes M. Padovani Blanco
Academic rank
Assistant Professor
Degrees with fields, institution, and date
B.S. in Chemical Engineering, University of Puerto Rico - Mayagüez, 1997 Ph.D. in Chemical Engineering, Georgia Institute of Technology, 2002
Number of years of service on this faculty, including date of original appointment and dates of advancement in rank
Years of service on this department: 2.75 Original appointment: January 2006
Other related experience, i.e., teaching, industrial, etc.
2 years of experience as a Senior Materials Engineer working for INTEL Corporation in Chandler, AZ (April 2002 – April 2004)
Consulting, patents, etc.
1. “Optical waveguides formed from nano air-gap inter-layer dielectric materials and methods of fabrication thereof” Tony Mule, Paul Kohl, James D. Meindl, Agnes Padovani, Thomas K. Gaylord, Elias N. Glytsis, Sue Ann B. Allen, U.S. Patent # 6,947,651, September 20, 2005. “Light transparent substrate imprint tool with light blocking distal end”, Agnes M. Padovani, U.S. Patent Application # 20050227497, March 19, 2004. “Stress-compensation layer systems for improved second level solder joint reliability”, Saikumar Jayaraman, Terry Sterrett, Connie Gettinger, Vijay Wakharkar, and Agnes Padovani, U.S. Patent Application # 20050068757, September 30, 2003.
States in which professionally licensed or certified, if applicable
NA
Principal publications of the last five years
1. A.M. Padovani, L. Rhodes, S.A. Bidstrup Allen, and P.A. Kohl, “Chemically Bonded Porogens in Methylsilsequioxane: I. Structure and Bonding,” <i>Journal of The Electrochemical Society</i> , 149 (12), F161-F170 (2002). 2. A.M. Padovani, L. Riester, L. Rhodes, S.A. Bidstrup Allen, and P.A. Kohl, “Chemically Bonded Porogens in Methylsilsequioxane: II. Electrical, Optical, and Mechanical Properties,” <i>Journal of The Electrochemical Society</i> , 149 (12), F171-F180 (2002).
Scientific and professional societies of which a member
NA

Honors and awards

2007 NSF-EPSCoR Faculty Start-Up Award

Institutional and professional service in the last five years

1. Coordinator of the Materials Science & Engineering Committee at the department-level since 2006
2. Member of the Engineering Research Committee of the College of Engineering since 2006

Percentage of time available for research or scholarly activities

50% time dedicated to research

Percentage of time committed to the program

50% time dedicated to teaching

Oscar J. Perales-Perez, Associate Professor

a. Professional Preparation

B.S., Metallurgical Engr., 1986, Univ. Nacional de Ingenieria, Peru
P.E., Metallurgical Engr., 1992, Univ. Nacional de Ingenieria, Peru
Ph.D., Materials Processing, 1998, Tohoku University, Sendai, Japan

b. Appointments

Associate Professor, Engr. Science & Materials Dept., Univ. P. Rico [July 2005 to date]
Assistant Professor, Gen. Engr. Dept., Univ. of P. Rico [Aug. 2002-June 2005]
Invited Professor, Graduate School, Department of Metallurgical Engineering, Univ. Nacional de Ingenieria, Peru [Dec 2001-July 2002].
Visiting Associate Professor in Materials Processing., Center for Interdisciplinary Research, Tohoku University, Japan. [Dec. 1998- Nov. 2001]
Consultant Engineer, SGS-Peruvian branch, Division of Environmental Issues.[Sept. 1994-Sept. 1995]
Project Engineer, Newmont Gold Corporation, Metallurgical Operations in Peru.[Nov. 1990-Aug. 1991]
Assistant Professor in Aqueous Processing, Department of Metallurgy, National Engineering University, Peru. [Oct. 1989-Jul. 2002].
Research & Consulting Engineer, MINERO-PERU, Division of Metallurgy, Peru [Jul. 1987-Jun. 1990]
Research Engineer, De-Re Metallica Laboratory: Hydrometallurgical processing, Peru.[Dec. 1985-Oct. 1986]

c.1 Five Publications Related to nanostructured materials (out of more than 40)

- A. Parra, O. Perales-Perez, P. Voyles, J. Zhu, W. Jia, M.S. Tomar. Structural, Optical and Magnetic Characterization of Monodisperse Fe-doped ZnO Nanocrystals., Journal of Applied Physics, 103, 7, 07D121 (2008).
- O. Perales-Perez, A. Parra-Palomino, R. Singhal, P. Voyles, J. Zhu, W. Jia, M.S. Tomar. Evidence of ferromagnetism in $Zn_{1-x}M_xO$ (M=Ni, Cu) Nanocrystals for Spintronics. Nanotechnology 18 (2007), 315606
- Perales-Perez O., M. S. Tomar, K. Tohji and A. Kasuya. Room-Temperature Aqueous Synthesis of Nanocrystalline ZnO Particles and its application in the generation of H_2 , Physica Status Solidi. (c) 1, No. 4, 803–806 (2004)
- S. P. Singh, O. Perales-Perez, A. Hidalgo, and M. S. Tomar. Doping Effects in Nanocrystalline ZnS Nanoparticles and thin films Produced by Chemical Bath Deposition, Physica Status Solidi. (c) 1, No. 4, 811–814 (2004)
- A. Kasuya, Y. Barunakiv, O. Perales et al. Size- and shape-controls and electronic functions of nanometer-scale semiconductors and oxides, Coll. And Surf. A: Physic. and Engn. Aspects, 202, [2-3], 291, (2002).

c.2 Other Five Significant Publications

- Y. Cedeno, O. Perales-Perez, P. Voyles, W. Stratton and P. M. Voyles. Tuning of Magnetic Properties in Cobalt Ferrite Nanocrystals. Journal of Applied Physics, 103, 7, 07E512, (2008)

- O. Perales-Perez, S. Dussan, M. Tomar. Room-temperature synthesis and characterization of highly monodisperse transition metal-doped ZnO nanocrystal.. NANOTECH , Vol. 2, 2006, pp 29-32.
- O. Perales, S. Dussan, M. Tomar, W. Jia. Low-Temperature Synthesis and Magnetic Characterization of Doped-Zns Nanostructures. NANOTECH 2006, Vol. 1, 2006, pp 447-450
- N. Chiannasammy, B. Jeyadevan, O. Perales, K. Tohji. Growth Dominant Co-Precipitation Process to Achieve High Coercivity at Room Temperature in CoFe₂O₄ Nanoparticles. Transactions IEEE Magnetism, 38, [5], 2640, (2002).
- Jeyadevan B., Perales O., Chinnasamy C. N., Kasuya A and Tohji K. Synthesis and Magnetic Properties of Core-Shell Structured (NiCo)O(AF_M)-NiCo(F_M) Magnetic Nanoparticles, Transactions IEEE Magnetism, 38, [5], 2595, (2002).

d. Synergistic Activities

- Co-Project Director of NSF PREM on Nanostructured & Functional Materials [2004 – 2009]. This is the largest grant ever awarded to UPRM in the field of Materials Sci. & Engineering (5 years, \$2.7 Millions).
- Co-Project Director, NSF-CREST Nanotechnology center for biomedical and energy-driven systems and applications (5 years, \$5M)
- Reviewer for: Hydrometallurgy, Journal of Applied Physics, Environmental Science and Technology, Nanotechnology, MRS Proceedings, National Institute of Water Research.
- Invited Panelist for NSF (SBIR/STTR Program on advanced materials and nanotechnologies)
- Chair of the Graduate Program on Materials Science at UPRM
- Chair of the Academic Affairs Committee, CoE-UPRM
- Member, materials Engineering Committee, 2002 to now
- Distinguished Professor College of Engineering, 2004-2005, 2006-2007, 2007-2008
- Fellow Faculty, Department of Materials Sci. & Engineering, UW-Madison, July 2004 to now

e. Percentage of time available for research or scholarly activities: 90%

f. Percentage of time committed to the MS&E Program: 10%

g. Thesis Advisor and Postgraduate-Scholar Sponsor Adrian Parra, MS-Physics. Graduated 2006; Luis Alamo, MS-CHEM. Graduated 2006. PhD in progress. Expected graduation June 2009; Sorelis Nieto, MS-CHEM. Graduated 2006; E. Calderon, MS-CHEM. Expected graduation June 2008; E. Chavarry, MS-ME. Graduated June 2007; B. Renteria, MS-ME. Graduated June 2007; S. Jauregui, MS-PHYS. Expected graduation, June 2008; A. Velasco, MS-ME. Expected graduation December 2008; D. Sanchez, MS-CHEM (co-advised). Expected graduation June 2007; D. Mazuera, MS-ME, expected graduation December 2009, C. Osorio, PhD-CHEM. Expected graduation June 2009; Y. Cedeño, PhD-CHEM. Expected graduation June 2009; T. Luna, PHD-CHEM (co-advised), expected graduation June 2010. *So far mentored a total of 40 Hispanic undergraduates conducting research.*

Post-Doctoral Fellow (1)

- Surinder P. Singh (2005), Assistant Professor, Dept. of E. S. & Materials, UPRM.



UNIVERSITY OF PUERTO RICO
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 College of Engineering
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 Mayagüez, Puerto Rico 00681-9044
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 Fax: (787) 265-3816

Curriculum Vitae

Name	Víctor R. Pérez Hernández
Academic rank	PE, Instructor
Degrees with fields, institution, and date	BSCE, UPRM 1977
Number of years of service on this faculty, including date of original appointment and dates of advancement in rank	Instructor-August 1978-December 1987 Full Time Instructor -January 1988 to Present Dic. 2008 Part Time
Other related experience, i.e., teaching, industrial, etc.	1977-1978 Regional Director Puerto Rico Environmental Quality Board 1988-2008 Project Supervisor for the PRHWA, Building Roads and Bridges
Consulting, patents, etc.	Wilfred Irizarry & Associates Architectural Services
States in which professionally licensed or certified, if applicable	Puerto Rico #8150
Principal publications of the last five years	N/A
Scientific and professional societies of which a member	CIAPR, ITCE, AEGSAC
Honors and awards	A series of awards for my public service to Moca Elementary School-President of the Parents Association, Public Service awards as employee of the PRHWA.
Institutional and professional service in the last five years	

Engineering Science and Materials Department, UPRM	
Professional Development activities: A series of seminars offered by the PRHWA, FHWA and PR Transportation Technology Transfer center dealing with road construction, security and management.	
Percentage of time available for research or scholarly activities	100%
Percentage of time committed to the program	100%

Curriculum Vitae

Name

Genock Portela Gautier

Academic rank

Assistant Professor

Degrees with fields, institution, and date

Philosophy Doctorate in Civil Engineering

University of Puerto Rico, Mayagüez Campus

Graduation date: June 2004

Major: Structures

Minor: Geotechnical and Foundation Engineering

Master of Science in Civil Engineering

University of Puerto Rico, Mayagüez Campus

Graduation date: June 2000

Major: Structures

Minor: Geotechnical and Foundation Engineering

Bachelor of Science in Civil Engineering

University of Puerto Rico, Mayagüez Campus

Graduation date: June 1997, Magna Cum Laude

Number of years of service on this faculty, including date of original appointment and dates of advancement in rank

Tenure track: July 1st 2008

Other related experience, i.e., teaching, industrial, etc.

Contract: July 1st 2004 – June 30, 2008

Consulting, patents, etc.

States in which professionally licensed or certified, if applicable

Professional Engineer, Puerto Rico Board of Engineers

Principal publications of the last five years

(2007) Portela G. and Godoy L. A., “Wind pressures and buckling of grouped steel tanks”. Wind and Structures, an International Journal, Vol. 10(1), pp.1-22, 2007.

(2006) Portela G., Virella J.C., Godoy L.A. (2006), “Computational model of wind damage in unanchored tanks”. Proceedings in 23rd South Eastern Conference on Theoretical and Applied Mechanics (SECTAM XXIII), Mayagüez, P.R.

(2006) Virella, J.C., Portela G. and Godoy L.A., (2006) “Toward an inventory and vulnerability of aboveground storage tanks in Puerto Rico. 4th Latin American and Caribbean Conference for Engineering and Technology, Breaking Frontiers and Barriers in

Engineering: Education Research and Practice”, Mayagüez, P.R.

- (2005) Portela G. and Godoy L. A. (2005), “A Cost-effective technique to repair cylindrical steel tanks exposed to hurricane wind loads in tropical settings”. Proceedings of the World Federation of Engineering Organizations (WFEO, October 2005), San Juan, Puerto Rico.
- (2005) Godoy L. A., Jaca R., Portela G., Sosa E. M., Virella J. C. (2005), “Damage of Oil Storage Tanks due to Wind and Earthquake”. Proceedings of the International Conference on the Behavior of Structures with Damage, DAMSTRUC 2005, Universidad Federal Fluminense, Rio de Janeiro, Brasil, August 2005.
- (2005) Godoy, L. A., Jaca R., Portela, G., Sosa, E. M., Virella, J. C. (2005), Structural consequences of natural hazards on metal storage tanks”. Third Latin American and Caribbean Conference for Engineering and Technology (LACCEI): Advances in Engineering and Technology A Global Perspective, Cartagena de Indias, Colombia.
- (2005) Portela G. and Godoy L. A. (2005), “Shielding effects and buckling of steel tanks in tandem arrays under wind pressures”. Wind and Structures. Vol. 8(5), pp. 325-342.
- (2004) Portela G. and Godoy L. A. (2005), “Wind pressures and buckling of cylindrical steel tanks: Tanks with dome roofs”. Journal of Constructional Steel Research, Vol. 61, pp. 786-807.
- (2004) Portela G. and Godoy L. A. (2005), “Wind pressures and buckling of cylindrical steel tanks: Tanks with conical roofs”. Journal of Constructional Steel Research, Vol. 61, pp. 808-824.
- (2004) Godoy, L. A., Sosa, E. M., and Portela, G. (2004), “Nonlinear dynamics and buckling of steel tanks with conical roof under wind”. Proceedings of the Fourth International Conference on Thin-Walled Structures, held in Loughborough, Leicestershire, United Kingdom, pp. 407-414.
- (2003) Portela-Gauthier, G., Godoy, L. A., and Zapata, R. (2003), “Wind tunnel simulation of group effects in tank farms”. Dimensión. Revista del Colegio de Ingenieros y Agrimensores de Puerto Rico, Volume 2, pp. 25-30.

Scientific and professional societies of which a member

1. American Concrete Institute, PR Chapter (ACI)
2. American Association for Wind Engineering (AAWE)

Honors and awards

Institutional and professional service in the last five years

Percentage of time available for research or scholarly activities

9 credits: Courses (75%)

3 credits: Release time for research (25%)

2007 – Present **US Army Corps of Engineers, Engineering Research and Development Center (ERDC) – University of Puerto Rico at Mayagüez**

Research Title: EVALUATION OF BRIDGES SUBJECTED TO MILITARY LOADING AND DYNAMIC HYDRAULIC EFFECTS.

2008 – Present **US Army Corps of Engineers, Engineering Research and Development Center (ERDC) – University of Puerto Rico at Mayagüez**

Research Title: ASSESSMENT OF BLAST DAMAGED STRUCTURAL BRIDGE COMPONENTS.

Percentage of time committed to the program

100%

Jaime E. Ramírez-Vick

Professor

Ph.D., Chemical Engineering, 1997, Arizona State University, Tempe, AZ
M.S., Chemical Engineering, 1989, University of Puerto Rico, Mayagüez, PR
B.S., Chemical Engineering, 1985, University of Puerto Rico, Mayagüez, PR

Years of Service:

- 07/07-Present Professor, Engineering Science & Materials Department, University of Puerto Rico, Mayagüez, PR
01/02-06/07 Associate Professor, Engineering Science & Materials Department, University of Puerto Rico, Mayagüez, PR

Other Related Experience:

- 05/01-Present President, Daedalus BioTechnologies, Berkeley, CA/Mayaguez, PR
04/00-04/01 Chief Technology Officer, Genetic Profiling Systems, Berkeley, CA
01/99-03/00 Director of Technology, Iris Biotechnologies, Inc., Santa Clara, CA
07/88-12/88 Postdoctoral Fellow, Cancer Center, University of California, San Francisco, CA
11/97-06/98 Lawrence Postdoctoral Fellow, Lawrence Berkeley National Laboratory, Berkeley, CA
08/94-10/97 Research Associate, Chem, Bio, and Materials Eng, Arizona State University, Tempe, AZ
07/93-07/96 Instructor and Developer, Continuing Education Courses for Industry, Mayagüez, PR
07/89-06/94 Instructor, Chemical Engineering Department, University of Puerto Rico, Mayagüez, PR
01/86-06/89 Research Assistant, Department of Physiology, Medical Sciences Campus, University of Puerto Rico, Rio Piedras, PR
08/88-05/89 Laboratory Instructor of Classical Mechanics, Physics Department, University of Puerto Rico, Mayagüez, PR
01/86-05/89 Laboratory Instructor of General Chemistry, Department of Chemistry, University of Puerto Rico, Mayagüez, PR

Consulting:

- 07/06 – Present ThermalCentric International Corporation, “Development of a carbon foam catheter.”
04/05 – 06/06 Foam Application Technologies, Inc., “Novel heat transfer applications for carbon foam.”
08/03 – 06/05 Eli Lilly and Company, Puerto Rico, Process Personnel Training, “Humalog process.”
05/03 – 05/04 Hewlett-Packard, “Development of a HT DNA microarray printing platform.”
01/03 – 06/04 Amgen, Puerto Rico, Process Personnel Training
01/03 – 05/06 Industrial Biotechnology Learning Center, Process Personnel Training

State in Which Registered:

Puerto Rico Engineer-in-Training 1984

Principal Publications (last five years)

Publications (Journals):

- Acevedo-Morantes, C. Y., H. B. Nicholas, Jr., J. E. Ramírez-Vick, "Bioinformatics Analysis of the CcmE protein in *Rhodobacter sphaeroides* 2.4.1," *Protein Science* (submitted 2008).
- Wen, S., and J. E. Ramírez-Vick, "Inferring Genetic Regulation Using Bayesian Network Model and Stochastic Simulation," *Bioinformatics* (In preparation).
- Wen, S., and J. E. Ramírez-Vick, "Learning Structures of Bayesian Boolean Network Model from Gene Expression," *BMC Bioinformatics* (In preparation).

Conference Proceedings:

- Rodriguez-Martinez, M, W Rivera, J Seguel, B Velez-Rivera, D Rodriguez, PI Rivera-Vega, and JE Ramírez-Vick. CISE Terascale Facility for GRID Applications at UPRM. 5th Annual Austin CAS Conference, February 19-20 (2004).
- Cordova-Bermeo, ME, and JE Ramírez-Vick. Expert System for Biochemical Pathway Inference. Proceedings CRC 2004, April 2 (2004).
- Castillo, L, M Arocha, A Esteves, J Ramirez-Vick, G Lee-Glauser, M Glauser, T Apple, Z Warhaft, R Vasquez, and D Freund. New Trends in Engineering Education: The AGEP: CNY-PR. IEEE Proceedings ITHET, July 7-9, 2005 (2005).
- PG Caceres, J Ramirez-Vick, and JD Carmona, "A Combinatorial Approach to the Synthesis of Carbon Nanotubes," 4th International Workshop on Combinatorial Materials Science and Technology, San Juan, PR, December 2-5, 2006.

Patents:

- Ramírez-Vick, J. E., and S. Chin, "Magnetic field-enhanced hybridization of target molecules to immobilized probes," US 6,852,493 B2 (2005).
- Ramírez-Vick, J. E., "Reversible binding of molecules to metal substrates through affinity interactions," US 7,108,971 B2 (2006).

Scientific and Professional Societies:

American Institute of Chemical Engineers, American Chemical Society
American Society for Cell Biology, International Society for Computational Biology

Honors and Awards (Last 5 Years):**Invited Talks:**

- "New Technologies for Detection and Surveillance," Forum for Innovation, INDUNIV, San Juan, PR, April 2-5, 2003.
- "High Technology Entrepreneurship," Keynote lecture, Computing Research Conference, University of Puerto Rico – Mayagüez, PR, April 2, 2004.
- "Bioinformatics: Innovations and Applications," Keynote lecture, 3rd Congress on Scientific Research, Interamerican University – Bayamón, PR, November 17, 2004.
- "The Impact of Genetic Testing on Dog Breeding," FCI Congress of the Americas, San Juan, PR, November 21-25, 2007

Awards:

- | | |
|--|------|
| Tenured, University of Puerto Rico | 2007 |
| Keynote Speaker, 3rd Scientific Research Congress, IAU - Bayamón | 2004 |

Keynote Speaker, Computing Research Conference, UPR – Mayagüez 2004

Institutional and Professional Service (last five years):

Puerto Rico TechnoEconomic Corridor - Biotechnology Cluster Think Tank Member, 2001

Ph.D. Program in Biotechnology, University of Puerto Rico at Mayagüez – Steering Committee, 2002

Ph.D. Program in Bioengineering, University of Puerto Rico at Mayagüez – Steering Committee, 2003

Institutional Biosafety Committee, University of Puerto Rico at Mayagüez – President, 2003

Institutional Review Board, University of Puerto Rico at Mayagüez – Member, 2008

Percentage of time available for research or scholarly activities: 50%

Percentage of time committed to the program: 50%

UNIVERSITY OF PUERTO RICO
MAYAGUEZ CAMPUS
College of Engineering
Department of Engineering Science and Materials

CURRICULUM VITAE

JOSEPH O. ROBINSON, P.E.
Associate Professor

Degrees :

MA, Psychology, Seton Hall University, 1984;
BE, Yale University, Civil Engineering, 1957

Faculty service at the U. of Puerto Rico, Mayaguez Campus:

Over ten years of service
Original appointment – January 1998
Advancement to Associate Professor – July 2007

Other related experience:

Academic:

County College of Morris, NJ. 1984-1987
Professor in the Mechanical Engineering Technology Dept. for 13 years.
Retired as an associate professor.

Industrial experience:

Exxon Research and Engineering, Florham Park, NJ, ten years as a project engineer.
Dravo Corporation, Pittsburgh, Pa, eight years, as a project engineer.
US Steel Corporation, Pittsburgh, PA, three years as a design engineer.

Consulting, patents, etc.: None

States in which professionally licensed: Licensed Engineer in Pennsylvania

Principal publications of the last five years: None

Scientific and professional societies of which a member: None

Honors and awards: I have been responsible for Raytheon's continuing support for our Pro/Engineer solid modeling license for the past seven years.

Institutional service:

- Created the INGE 3809 Creative Design course.
- Redesigned the INGE 3012 course to use AUTOCAD to solve descriptive geometry problems.
- Served on the Engineering Graphics Committee for ten years. For five years was graphics lab coordinator
- For the past six years obtained grants from Raytheon for 500 Pro/ENGINEER software licenses for the University of Puerto Rico.
- Taught several Pro/ENGINEER seminars for the benefit of professors from the Mayaguez campus and from other U. of PR campuses.
- Taught a Pro/ENGINEER seminar for the benefit of students who had not had the opportunity to take the INGE 3017 course.

Percentage of time available for research or scholarly activities: 10

Percentage of time committed to the program: 30

Curriculum Vitae

Name Jeannette Santos

Academic rank Professor

Degrees with fields, institution, and date

Ph.D. Chemical Engineering	Louisiana State University – Baton Rouge	1995
M.S. Chemical Engineering	University of Wisconsin – Madison	1982
B.Sc. Chemical Engineering	University of Puerto Rico, Mayagüez	1980

Number of years of service on this faculty, including date of original appointment and dates of advancement in rank

2006	Professor, University of Puerto Rico, General Engineering Department
2001- 2006	Associate Professor, University of Puerto Rico, General Engineering Department, Mayagüez, Puerto Rico.
1996 - 2001	Assistant Professor, same as above
1987 - 1991	Instructor, University of Puerto Rico, Department of Physics and Chemistry, Arecibo, Puerto Rico.

Other related experience, i.e., teaching, industrial, etc.

1987	Process Engineer, The Upjohn Manufactory Company, Barceloneta, Puerto Rico. Technical support for the preparation of clindamicine phosphate process.
1985 - 1986	Instructor, University of Puerto Rico, Department of Physics and Chemistry, Arecibo, Puerto Rico.
1984	Lecturer, University of Puerto Rico, Chemical Engineering Department, Mayagüez, Puerto Rico. Service Contract.
1983	Lecturer, Interamerican University, Department of Natural Science, Aguadilla, Puerto Rico. Part time contract.

Consulting, patents, etc.

States in which professionally licensed or certified, if applicable

Principal publications of the last five years

7. J. Santos, W. Crone, G.M. Zenner, O. M. Suárez, “Experiences in Advancing Materials Engineering Education in Public High School via Teachers’ Training,” *Latin American and Caribbean J. Engineering Education*, 1, [1], (2007): pp. 3-7.
8. F. J. Acosta, J. Santos, O. M. Suárez, M. A. Pando, “Raising Awareness on Materials Recycling using Undergraduate Engineering Research,” *Intl. J. Environment & Pollution*, 31 [3/4], (2007): pp. 325-341.
9. J. Santos, S. Pedraza, E. Marrero, O. M. Suárez, “Exposing High School Students to Materials Science and Engineering Concepts,” 9th International Conference on Engineering Education, San

Juan, Puerto Rico, July 2006.

10. O. M. Suárez, J. Santos, W. C. Crone and G. M. Zenner, “Development and Optimization of Instruction Modules for High School Teachers on Materials Science and Engineering Education,” 9th International Conference on Engineering Education, San Juan, Puerto Rico, July 2006

J. Santos, W. Crone, G. M. Zenner, O. M. Suárez, “Educational Modules for High School Teachers on Materials,” Fourth LACCEI International Latin American and Caribbean Conference for Engineering and Technology, Mayagüez, Puerto Rico, June 2006.

Scientific and professional societies of which a member

SWE, ASEE

Honors and awards

- Distinguished Professor of the General Engineering Department, UPRM, 2005-2006
- Dean Fellowship Scholar Louisiana State University 1991-1993
- Luis A. Monzón Award University of Puerto Rico 1980

Institutional and professional service in the last five years

- Academic Excellence Program for freshman engineering students led by a mentor student to establish supporting teams.
- Classroom performance system tool to improve the learning experience of the fundamental computer programming concepts in the Algorithms and Computer Programming course offered to all Engineering students during their sophomore year.
- Education Coordinator for a Cooperative Agreement with NOAA/NWS
- Liaison Officer of LSAMP during 2002 – 2003, 2005-present, Member of Task force 10 – Related Educational Activities for the preparation of Middle State evaluation.
- Research mentor of undergraduate student working on aggregates of concrete.
- Coordinator of the Outreach and Education Office for the NSF-funded PREM project.
- Supervisor and University Mentor of seven Materials Science & Engineering clubs established in public schools in Western Puerto Rico with the participation of more than 120 students.

Percentage of time available for research or scholarly activities 25%

Percentage of time committed to the program 50-75%

Basir Shafiq

Professor, Department of Engineering Science and Materials
University of Puerto Rico, Mayagüez, PR 00681

Phone: 787-832-4040 ext. 2094, Fax: 787-265-3816, Email: basir_shafiq@uprm.edu

Professional Preparation

- Southern Illinois University Engineering Mechanics B.S. 1989
- University of Illinois at Chicago Engineering Mechanics M.S. 1990
- University of Illinois at Chicago Engineering Mechanics Ph.D. 1996

UPRM Appointments

- Professor, Engineering Science and Materials Department, University of Puerto Rico (07/06 to present)
- Associate Professor, General Engineering Department, University of Puerto Rico (07/01 to 06/06)
- Assistant Professor, General Engineering Department, University of Puerto Rico (07/96 to 06/01)
- Research Faculty, Naval Air Warfare Center, PAX River, Maryland (Summer 1999-2002)
- Adjunct Faculty, Triton College, Rivergrove, Illinois (08/91 to 12/95)

Other Experience

Engineer, Boeing Aircraft Company, Structures Division, Wichita, Kansas (Summer 2006)

- Worked on some aircraft stress and fatigue analysis problems. Sorted and compiled flight data information in order to compile an in-service fatigue life profile of commercial Boeing aircraft.

Research Faculty, Naval Air Warfare Center, PAX River, Maryland (Summer 1999-2002)

- Studied the effect of various loading, micromechanical and environmental parameters on the fatigue crack growth behavior of high strength aircraft structural alloys.

Research Assistant, University of Illinois, Chicago, Illinois (08/90 to 05/96)

- Carried out extensive fatigue lifetime characterization of quasi-brittle composite materials.

Adjunct Faculty, Triton College, Rivergrove, Illinois (08/91 to 12/95)

- Taught basic mathematics and computer science courses.

Publications

1. S. Charca, A. Quispitupa, **B. Shafiq**, Fatigue Lifetime Events Detected Using Acoustic Emission Technique, submitted to *Journal of Mechanical Behavior of Materials*, Vol. 4, No. 18, pp. 43-55, 2008.
2. **B. Shafiq**, A. Quispitupa, S. Charca, O. Uwakweh: "Hydrogen Assisted Fatigue Lifetime Characteristic of AF1410 Steel", *AIAA Journal of Aircraft*, accepted August 2007.
3. O.Uwakweh, S. Charca, V. Agarwala, **B. Shafiq**, "Characterization of Hydrogen Permeation in Armco-Fe during Cathodic Polarization in Aqueous Electrolytic Media" *Journal of Materials Engineering and Performance*, DOI: 10.10097/s116565-007-9114-3.

4. A. Quispitupa, **B. Shafiq**, S. Charca, O. Uwakweh, M. Suarez, “Effect of Hydrogen and Hold Time on the Fatigue Lifetime of AF1410 Aircraft Structural Steel”, *AIAA-Journal of Aircraft*, Vol. 44, No. 2, pp. 453-458, 2007.
5. A. Quispitupa, M. Suárez, S. Charca, **B. Shafiq**, O. Uwakweh: “Fatigue and Hydrogen Embrittlement Evaluation of AF1410 Steel”, *International Journal of Microstructural and Material Properties*, vol. 2, n. 3/4, pp. 373-387, 2007.
6. F. Just, **B. Shafiq**, D. Serrano, “Development of a Damage Detection Scheme Applicable to Sandwich Composites”, *Journal of Sandwich Structures and Materials*, Vol. 9, No. 4, 343-363, 2007.
7. F. Just, D. Serrano, **B. Shafiq**, A. Cecchini, “Neural Network Based Nondestructive Evaluation of Sandwich Composites”, *Journal of Composites, Part B*, Vol.39, pp. 217-225, 2008.
8. F. Just, **B. Shafiq**, D. Serrano, M. Ortiz: “Damage Detection in Sandwich Composites Using Damping Matrix Identification”, *Journal of Mechanical Behavior of Materials*, Vol. 17, No. 1, pp. 17-29, 2006.
9. A. Quispitupa, **B. Shafiq**, M. Suarez, O. Uwakweh, N. Duque: “Corrosion Fatigue of High Strength Aircraft Structural Alloys”, *AIAA Journal of Aircraft*, Vol. 43, No. 3, pp. 787-792, 2006.
10. **B. Shafiq**, A. Quispitupa: “Fatigue Characteristics of Foam Core Sandwich Composites”, *International Journal of Fatigue*, Vol. 28, No. 2, pp.96-102, 2005.
11. C. Toro, **B. Shafiq**, D. Serrano, F. Just: “Eigen-Parameter Based Damage Detection in Sandwich Composite Ship Hull Structures”, *Journal of Mechanical Behavior of Materials*, Vol. 16, No. 6, pp. 393-405, 2005.
12. **B. Shafiq** and V. Agarwala: “Corrosion Fatigue in 7075-T6 Aluminum: Life Prediction Issues for Carrier Based Operations”, *AIAA - Journal of Aircraft*, Vol. 41, No. 2, pp. 393-398, 2004.
13. A. Quispitupa, **B. Shafiq**, F. Just, D. Serrano: “Acoustic Emission Based Tensile Characteristics of Sandwich Composites”, *Composites Part B: Engineering*, Vol. 35, No. 6-8, pp. 563-571, 2004.
14. F. Just, **B. Shafiq**, J. Jairo and D. Serrano: “Damage Detection Using Transient Temperature Response”, *International Journal of Natural Disasters, Accidents and Civil Structures*, Vol. 3, No. 3, pp. 129-141, June 2004.
15. D. Barkah, **B. Shafiq** and D. Dooner: “3-D Mesh Generation for Static Stress Determination in Spiral Noncircular Gears Used for Torque Balancing”, *ASME Journal of Mechanical Design*, Vol. 124, No. 2, pp. 313-319, 2002.
16. M. Issa and **B. Shafiq**: “Fatigue Characteristics of Aligned Fiber Reinforced Quasi-Brittle Materials”, *ASCE Journal of Engineering Mechanics*, Vol. 125, No. 2, pp. 156-164, 1999.
17. M. Issa, **B. Shafiq** and A. Hammad: “Crack Arrest in Mortar Reinforced with Unidirectionally Aligned Fibers”, *Cement and Concrete Research*, Vol. 26, No. 8, pp. 1245-1256, 1996.
18. J. Botsis and **B. Shafiq**: “Crack Growth Characteristics of an Epoxy Reinforced with long Aligned Fibers”, *International Journal of Fracture*, Vol. 58, pp. r3-10, 1992.

Grants Received

- DoD-ONR \$637,900 (Co-PI) (October 2006 – September 2009)
Comprehensive Investigation of Lifetime Characteristics of Nano Structured Sandwich Composites
- NSF-IMR \$339,088 (Co-P.I.) (August 2004 – July 2006)
Acquisition of Field-Emission Scanning Electron Microscope to Promote Research and Education in Materials Engineering
- DoD-ONR \$593,935 (P.I.) (June 2003 – September 2006)
Life Prediction Methodology for Landing Gears and Arresting Shanks: A Novel Approach
- Do-Ed \$466,686 (Co-P.I.) (July 2002 – June 2005)
Material Science and Engineering Education Improvement for a Hispanic Serving Institution
- DoD-ONR \$473,000 (Co-P.I.) (October 2001 – May 2005)
Affordable Processing and Dynamic Characterization of Sandwich Composite Materials Used in Stealth Applications
- NSF \$623,000 (CO-P.I.) (December 2000 – December 2003)
Affordable Processing and Dynamic Characterization of Sandwich Composite Materials and Structures
- Naval Air Warfare Center \$30,000 (P.I.) (September 2001)
Donation from Naval Air Warfare Center to retrofit a servo-hydraulic testing machine
- UPRM \$5,000 (P.I.) (March 1997)
Seed money

Research and Teaching Time

- 75% teaching and 25% research

OSCAR MARCELO SUÁREZ

Associate Professor

(a) Degrees

Ph.D. Degree, Metallurgical Engineering, University of Wisconsin-Madison, June 2000

M.S. Degree, Metallurgical Engineering, University of Wisconsin-Madison, June 1993

B.S. Degree, Aeronautical & Mechanical Engineering, Universidad Nacional de Córdoba, Argentina August 1984

(b) Appointments

Tenured Associate Professor at the Department of Engineering Science & Materials, Univ. of Puerto Rico – Mayagüez [July 2004 to date]

Assistant Professor at the Department of General Engineering, Univ. of Puerto Rico – Mayagüez [Aug. 2000 - June 2004]

(c) Other related experience

Lecturer (Course MS&E 361 “*Materials Laboratory II*”) at the Dept. of Materials Science and Engineering, Univ. of Wisconsin – Madison [Jan. 2000 -May 2000]

Teaching Assistant at the Dept. of Materials Science and Engineering, Univ. of Wisconsin – Madison [1995 -1999]

Assistant Professor at the Dept. of Materials and Technology, at the Universidad Nacional de Córdoba, Argentina, [Sept. 1986-Aug. 1990]

(d) Publications (15 selected – last 5 years)

- H. Calderón Arteaga, O. M. Suárez, E. Barrios Zamudio, “Thermomechanical Effects on Aluminum Matrix Composites Reinforced with AlB_2 Particles,” *J. of Composite Materials*, (2008) [in print].
- Z. H. Melgarejo, O. M. Suárez, K. Sridharan, “Wear Behavior of Functionally Graded Al-Mg-B Composites Fabricated by Centrifugal Casting,” *Composites Part A*: 39 [7], (2008): pp. 1150–1158.
- A. Quispitupa, O. M. Suárez, S. Charca, B. Shafiq, O. Uwakweh, “Fatigue and Hydrogen Embrittlement of AF1410 Steel,” *Intl. J. of Microstructure and Materials Properties*, 2, [3/4], (2007): pp. 373-387..
- F. J. Acosta, J. Santos, O. M. Suárez, M. Pando, “Raising Awareness on Materials Recycling using Undergraduate Engineering Research,” *Intl. J. of Environment & Poll.*, 31 [3/4], (2007): pp. 325-341..
- A. Quispitupa, B. Shafiq, O. Uwakweh, S. Charca, O. M. Suárez, “Effect of Hydrogen and Hold Time on the Fatigue Lifetime of AF1410 Aircraft Structural Steel,” *J. of Aircraft*, 44 [2], (2007): pp. 453-458.
- J. Torres, S. Charca, O. M. Suárez, O. N. C. Uwakweh, “Numerical Approximation of Hydrogen Transport in Steels Using Java Programming,” *J. of Materials Education*, 29 (2007): pp. 193-206.
- R. G. I. Hidalgo, S. Pedraza, O. M. Suárez, E. E. Hellstrom, “Microcharacterization of Al-B-Cu Composites,” *TMS Letters*, 3 [2], (2006): pp. 59-60.
- A. Quispitupa, B. Shafiq, O. M. Suárez, O. Uwakweh, N. B. Duque, “Corrosion Fatigue of High Strength Aircraft Structural Alloys,” *J. of Aircraft*, 43 [3], (2006): pp. 787-792.
- Z. H. Melgarejo, O. M. Suárez, K. Sridharan, “Wear Resistance of a Functionally-Graded Aluminum Matrix Composite,” *Scripta Materialia*, 55 [1], (2006): pp. 95-98.

- N. B. Duque, Z. H. Melgarejo, O. M. Suárez, “Functionally Graded Aluminum Matrix Composites Produced by Centrifugal Casting,” *Materials Characterization*, 55 [2], (2005): pp. 167-171.
- J. H. Botero, M. O. Valentín, O. M. Suárez, J. Santos, F. J. Acosta, A. Cáceres, M. A. Pando, “Shredded Tires: State of the Art, Current Situation and Possible Uses as Commodity in Puerto Rico,” *Revista Internacional de Desastres Naturales, Accidentes e Infraestructura Civil*, 5 [1], (2005): pp. 69-86.
- O. M. Suárez, “A Study of the Role of Diborides in the Heterogeneous Nucleation of Aluminum,” *Revista de Metalurgia, Spain*, 40 [3], (2004): pp. 173-181.
- O. M. Suárez, R. D. Kendrick, C. R. Loper Jr., “Como o Banho de Ferro Fundido Nodular Pós-Inoculado Reage às Adições de Enxofre,” *Fundição e Serviços*, 14 [137], (2003): pp. 22-34.
- O. M. Suárez, E. Barrios Zamudio, C. R. Loper Jr., “On Late Sulfur Addition and Graphite Morphology in High Carbon Ductile Irons,” *Transactions of the American Foundry Society*, 111, (2003): pp. 665-674.
- O. M. Suárez, R. D. Kendrick, C. R. Loper Jr., “Late Sulfur Inoculation of Spheroidal Graphite Cast Irons,” *International Journal of Cast Metals Research*, 16 [1-3], (2003): pp. 1-7.

(d) Scientific and professional societies

- | | |
|---|--|
| • Materials Research Society MRS | • American Society for Materials ASM Intl. |
| • Assoc. for Iron & Steel Technology AIST | • The Minerals, Metals & Materials Society TMS |
| • American Ceramics Society ACerS | • The International Metallographic Society IMS |
| • Sigma Xi Honor Research Society | • Am. Society for Engineering Education ASEE |

(e) Honors & awards (selected)

- 2004-2005 Distinguished Professor, in recognition for outstanding academic achievements awarded by the Dept. of General Engineering, Univ. of Puerto Rico-Mayagüez, May 2005.
- Monthly World Most Relevant Article on Foundry Issues, acknowledged by the Fundidores magazine, Madrid, Spain for the article “Late Sulfur Inoculation of Spheroidal Graphite Cast Irons,” published in Intl. J. of Cast Metals Research, 16, (2003): pp. 1-7.
- 2002-2003 Distinguished Professor, in recognition for outstanding academic achievements awarded by the Dept. of General Engineering, Univ. of Puerto Rico-Mayagüez, May 2003.
- Excellence in Teaching Award in recognition for outstanding teaching at the Univ. of Wisconsin-Madison, conferred by the Graduate School, University of Wisconsin-Madison, May 2000.

(f) Institutional and professional service (last 5 years)

- Member of the Personnel Committee of the Dept. of Engineering Science & Materials, Univ. of Puerto Rico – Mayagüez [Aug. 2005 to date]
- Chair of the Graduate Studies Committee of the College of Engineering, Univ. of Puerto Rico – Mayagüez [Nov. 2004 to March 2008]
- Member of the Faculty Affairs Committee of the College of Engineering, Univ. of Puerto Rico – Mayagüez [Nov. 2002 to Sept. 2004]
- Coordinator of the Engineering Materials Committee at the Dept. of General Engineering, Univ. of Puerto Rico – Mayagüez [Sept. 2000 – March 2003]

- Member of the Committee for ABET 2002 of the Coll. of Engineering, Univ. of Puerto Rico – Mayagüez [Sept. 2000 - March 2003]
- Reviewer of the Metallurgical & Materials Trans. A, Springer-Verlag Publ., since 2007.
- NSF Panelist of REU program, Division of Materials Research, 2006.
- Reviewer of the Journal of Materials Processing Technology, Elsevier Publ., since 2006.
- Technical Committee Co-Chair of the 2006 International Conference on Engineering Education, San Juan, Puerto Rico, July 23-28, 2006.
- NSF Panelist of PREM program, Division of Materials Research, 2006.

(g) Percentage of time available for research and scholarly activities: 37.5%

(h) Percentage of time committed to the program: 10%

Curriculum Vitae

Arsalan Shokooh
P.O. Box 8013
Mayaguez, PR 00681-8013
Tel. (787)831-0142
Email: ashokooh@uprm.edu

Education

M.S. in Computer Science, Dec. 1983, Memphis State University, Memphis, Tennessee.

Ph.D. in Theoretical Mechanics, May 1977, Illinois Institute of Technology, Chicago, Illinois. Subject of thesis: Stress Clock Function in Viscoelastic Materials. Thesis advisor: Barry Bernstein.

M.S. in Mechanics, May 1974, Illinois Institute of Technology, Chicago, Illinois. Subject of thesis: Design and modeling of air flow equipment and heat panels associated with heating and cooling of buildings.

B.S. in Mechanical Engineering, Dec. 1971, Louisiana State University, Baton Rouge, Louisiana. Area of concentration: machine design.

IFRICS (Institute For Retraining In Computer Science) Certificate of Completion, Clarkson University, Potsdam, New York, 1985-1986

Unix System Management, Digital Equipment Corp., Landover, MD, Summer 1989.

Unix System Programming, Digital Equipment Corp., Landover, MD, Summer 1989.

Novell Netware System Management, Novell, San Juan, PR, Spring 1991.

Vibration and Damping Workshop, University of Dayton, July 1993.

Programming in AutoLisp, Union, NJ, December 1993.

Postdoctoral Fellowship

Northwestern University (5-1977 to 10-1979). Cooperator: Professor S. Nemat-Nasser.

A. Shokooh

Page 2

Research Fellowship

NASA Goddard Space Flight Center (Summer 2000 and 2001). Analysis, modeling and design of vibration and noise controls in spacecrafts.

NASA Langley Research Center (Summer 2003). Probabilistic analysis of dynamical structures.

Grants

Received a three-year grant from NASA-Langley to carry out basic research on the mechanism and response of materials with damping, vibration and noise control.

Seminars Offered

A 5-day seminars on "Effective Teaching of Mathematics to Engineering Students," Dept. of Mathematics, Interamerican University, Bayamon, PR, Jan. 1994.

Have offered a number of on/off-Campus seminars on C, C++, computer graphics, and computational mechanics for private and public sector employees.

New Courses

Developed a new course titled "Advanced Applied Numerical Computation." Its aim is to develop efficient (in terms of both time and space) algorithms for many of the engineering, science, and mathematical problems of interest to graduate students.

Developed a new course titled "Advanced Engineering Method." Its aim is to expose engineering graduate students to a number of mathematical subjects and methods that have direct bearing on their understanding of advanced subjects in engineering.

Summary of Research and Experience

Summer 2000 and 2001, NASA's Goddard Space Flight Center. Examined, and developed effective models for, controlling an spacecraft's vibration and noise due to the random acoustic load produced by the rocket's thrusters. The work required studying and analyzing the geometry, structure and materials of spacecraft's decks and recommending ways to control the vibration and the modeling of the finite element method of the structure.

Examined, and developed mathematical models to represent, static and dynamic behavior of various types of materials (elastic, viscoelastic, viscoplastic, porous, etc.) undergoing various types of deformations,.

Examined, and developed mathematical models to represent, the response of various structures (machine elements, foundations, structures, and so on) with damping materials subjected to a variety of loading conditions (constant, time

varying, random), as a function of temperature and frequency, using fractional calculus, and developed mathematical model

Examined the stability of some of the widely used elsto-plastic models.

Analyzed the mechanism and performance of heat panels and the associated air carrying apparatus, and assisted in their design.

Estimating lines of codes (LOC), cost of medium and large software, and qualitative evaluation of large real-time systems, database systems, and decision-support systems.

Authored a comprehensive set of guidelines for the entire development cycle of a project beginning with the analysis phase through the testing and integration phase.

Have developed a number of engineering, technical, scientific, application and system software of medium to large size.

Have devised efficient algorithms to handle large electrical network load flow with circuit breakers, short circuit problems, and dynamic stability problems.

A. Shokooh

Page 4

Honors and Award

Four year on the Dean's Honor List at Louisiana State University; three times recipient of the International Scholarship award; three times recipient of the President Scholarship award; recipient of the honorary membership to the Honor Society of Phi Kappa Phi; graduated cum laude; recipient of various fellowships and research assistantship during graduate years.

Professional Membership

Association for Computing Machinery, American Academy of Mechanics, The Mathematical Association of America.

Personal Data

US citizen; married; four daughters.

SUMMARY OF EMPLOYMENT

U.P.R. Mayaguez Campus (1/90-present)

Mechanics of material I and II, machine design I and II, computer-aided design (finite element techniques, optimization, and simulation), statics, dynamics, numerical computation, database systems, and software engineering.

Tennessee Tech. University (1/85-1/90)

Tenured professor of Computer Science. Taught computer science (software design, database management systems, operating systems, computer organization and architecture, programming languages, programming, algorithm development and analysis, theory of computation, networks, data structures, numerical techniques and analysis, network).

U.P.R. (11/79-1/85)

Taught basic engineering courses in mechanics of material, material science, statics, dynamics, and computational methods in engineering.

A. Shokooh

Page 5

Northwestern University (6/77-10/79)

As a postdoctoral fellow, cooperated with professor Nemat-Nasser to examine the behavior of plastic, elastic, and viscoelastic materials undergoing large deformations., the static and dynamic behavior of porous materials, and the stability of some the widely used models.

Texas Instruments (May '87 - May '89)

Software engineer and software metric consultant.

Operation Technology (Jan. '86 - Oct. '92)

Chief numerical analyst.

PUBLICATIONS AND PRESENTATIONS

Note: Articles 1, 3-6, 7, and 17-20 that deal with mathematical modeling, are cited extensively in the literature as seminal works in their respective areas.

1. "Stress Clock Function in Viscoelasticity," presented at the 48th Annual Meeting of the Society of Rheology, Madison, Wisconsin, October 23-27, 1977.
2. "On Localized Deformation in Biaxial Tension," co-authored with S. Nemat-Nasser and M. Taya, Report No. 10-7-78, Northwestern University, Evanston Illinois, July, 1978.
3. "Unified Theory of Densification and Liquefaction of Cohesionless Sand," co-authored with S. Nemat-Nasser, Earthquake Research and Engineering Laboratory, Technical Report No. 77-10-3, Department of Civil Engineering, Northwestern University, Evanston, Illinois, October, 1977.

A revised edition was published in the Canadian Geotechnical Journal, Vol. 16, 659-678 (1979).

4. "Densification and Liquefaction of Sand in Cyclic Loading," co-authored with S. Nemat-Nasser, Proceedings of the Central American Conference of Earthquake Engineering, San Salvador, El Salvador, C.A., January 9-12, 1978.
5. "Densification and Liquefaction of Cohesionless Sand," presented at the Eighth US. National Congress of Applied Mechanics, University of California, Los Angeles, June 26-30, 1978.
6. "A New Approach for the Analysis of Liquefaction of Sands in Cyclic Shearing," co-authored with S. Nemat-Nasser, Proceedings of the Second International Conference of Micronization for Safer Construction, San Francisco, CA, November 26-29, 1978.
7. "Stress Clock Function in Viscoelasticity," co-authored with B. Bernstein, Journal of Rheology, Vol. 24(2), 189-211 (1980).
8. "On Finite Plastic Flows of Compressible Materials with Internal Friction," co-authored with S. Nemat-Nasser, International Journal of Solids and Structures, Vol. 16, 495-514 (1980).

A. Shokoooh

Page 7

9. "A Framework for Prediction of Densification and Liquefaction of Sands in Cyclic Shearing," co-authored with S. Nemat-Nasser, *Ingenieur Archive*, Vol. 49, 381-392 (1980).
10. "A Fast Algorithm for the CPM/PERT Technique," invited paper, presented on the occasion of the 25th anniversary of the Center for Computer, University of Puerto Rico, Mayaguez Campus, December 1983.
11. "Estimation of Lines of Code for Large Software Projects," co-authored with B. Caperton, *Proceedings of the 26th Annual Southeast Regional Conference ACM*, April 20-22, 1988, Mobile, Alabama, p. 703.
12. "The State-Event Calculus as a Basis for Completeness Checking," co-authored with F. Hadlock, F. and R. Anger, *Proceedings of the 27th Southeast Regional Conference ACM*, April 5-7, 1989, Atlanta, GA, P. 40.
13. "A Systematic Procedure for Estimating Lines of Code," *Proceedings of the 29th Annual Southeast Regional Conference ACM*, April 10-12, 1991, Auburn, AL, P. 377.
14. "A Note on Dislocation Density in Layered Surfaces," to be submitted.
15. "A Note on the Fractional Calculus Modeling of Damping Materials," co-authored with L. Suarez, presented at , and published in the *Proceedings of the joint Annual EPSCoR-AAAS Meeting*, May 6-7, 1994, San Juan, PR.
16. "On the Fractional Derivative Modeling of the Damping Material," co-authored with L. Suarez, report submitted to NASA-Langley, May 1994.
17. "On the Laplace Solution of Semi-differential Equations of Motion of Single of Freedom Systems," co-authored with L. Suarez, *Proceedings of Annual Pan-American Conference on Applied Mechanics*, Jan. 1995, Buenos Aires, Argentina. (refereed papers only).
18. "Difficulties Associated with the Fractional Derivative Modeling of Systems with Damping Materials," co-authored with L. Suarez, *Proceedings of the 65th Shock and Vibration Symposium of the Naval Command, Control and Ocean Surveillance Center*, Oct. 31 - Nov. 3, 1994, San Diego, Ca. (refereed papers only).

A. Shokooh

Page 8

- 19- Shokooh, A. and Suarez, L. "On the Laplace Transform Solution of the Semi-differential Equation of Motion of a Single DOF Oscillator," Proceedings of the 10th Conference of Engineering Mechanics, Ed. Stein Sture, University of Colorado at Boulder, May 21-24, 1995, pp. 1267-1271.
20. "On the Response of Systems with damping Materials Modeled using Fractional Calculus," co-authored with L. Suarez, Proceedings of the 10th ASCE Engineering Mechanics Conference, University of Colorado at Boulder, May 21-24, 1995 (refereed papers only).
- 21- Suarez, L. and Shokooh, A., "Fractional Derivative Modeling of Systems with Damping Materials," special issue of the ASME Applied Mechanics Review, November 1995 (in press).
- 22- Suarez, L. and Shokooh, A , "Finite Element Analysis of Beams with Damping Materials", Applied Mechanics Reviews, Volume 50, Number 11, Nov. 1997 .
23. "Comparison of Numerical Methods Applied to Fractional Model of Damping Materials," Journal of Vibration and Control, 1999.
24. "Eigenvector Expansion for the Solution of Equations of Motion with Fractional Damping," accepted for publication in Applied Mechanics.
25. "Solution of Nonlinear Equations of Motion with Fractional Damping;" in preparation.
26. "On the Fourier Transform Solution of Semi-differential Equations of Motion;" in preparation.

Curriculum Vitae

Name: Freya M. Toledo Feria

Academic rank:

Associated professor

Degrees with fields, institution, and date:

BSIE, UPR Mayaguez, 1983
MSIE, University of Massachusetts, 1985

Number of years of service on this faculty, including date of original appointment and dates of advancement in rank

17 years of services (interrupted by a 7 year leave of absence period)
Appointed Instructor on 1985
Assistant professor – 1991
Associate professor - 2002

Other related experience, i.e., teaching, industrial, etc.

Undersecretary of Planning for the Department of Transportation and Public Works
Director of the Transportation Planning Office for the Highway and Transportation Authority
Consulting, patents, etc.

N/A

States in which professionally licensed or certified, if applicable

N/A

Principal publications of the last five years

N/A

Scientific and professional societies of which a member

Society of Women Engineers, SHPE, Alpha Delta Kappa

Honors and awards

Institutional and professional service in the last five years

UPRM Academic Senate (member of 3 of its permanent committees, president of one)
UPRM Administrative Board
Women Advisory Committee for the Mayagüez 2010 related activities

Percentage of time available for research or scholarly activities

100%

Percentage of time committed to the program

100%

DEPARTMENT OF ENGINEERING
SCIENCE AND MATERIALS

ABET COURSES SYLLABI

NOVEMBER 2008

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Engineering Science and Materials

COURSE SYLLABUS

1. Course Number and Title: INGE 3011, Engineering Graphics I
 Two credit hours, Required course

2. Catalog description: Principles of graphic language: Fundamentals of delineation, analysis and solution of space problems, symbols and standards as applied in engineering. Freehand drawing as a tool for visualization. Principles of orthographic projection, sections, auxiliary views and conventional practices. Pictorial drawings: axonometric, oblique and perspective. Introduction to descriptive geometry. Hand and computer-aided drawing.

3. Prerequisites: None

4. Textbook(s) and/or Other Required Material: James Earle, *Graphics Technology*, Second Edition (2005), Addison-Wesley; James Earle, *Graphics & Geometry 3*, Creative Publishing. Supplies and material: Mechanical pencil .5mm, Erasers, Irregular curves, Compass, 45 and 30/60 degree Triangles, Protractors, Architect’s Scale, Civil Engineer’s Scale and Metric Scale.

5. Course Learning Outcomes: After completing the course, the student should be able to: Make sketches of conceptual products, Develop graphics solution to common geometrical problems, Make 2-D and 3-D Pictorial drawing with a computer, Understand engineering drawings, Understand the engineering design process, Apply notes and dimensions, Communication of ideas,

6. Topics Covered:

Engineering Design Process, Traditional tools, Freehand sketching and Techniques, Geometric Construction, Multi-view Projection, Primary Auxiliary Views, Sectioning Basic, Pictorial Drawing, Isometric Projection, Oblique Drawing, Design Documentation and Dimensioning, CADD

7. Class/Laboratory Schedule: One hour of lecture and two one-and one-half-hour laboratories per week

8. Contribution of Course to Meeting the Requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x			x			x				x

10. Person(s) who prepared this description and date of preparation:

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Engineering Science and Materials

COURSE SYLLABUS

1. Course Number and Title: INGE 3012, Engineering Graphics II

Two credit hours, Required course

2. Catalog description: Underlying principles of the graphic language: fundamentals of delineation, analysis and solution of space problems, symbols and standards as applied to engineering, spatial geometry: distances between planes and lines, angles between lines and planes, rotation problems. Introduction to graphical mathematics and nomography.

3. Prerequisites: INGE 3011

4. Textbook(s) and/or Other Required Material: James Earle, *Graphics Technology*, Second Edition (2005), Addison-Wesley; James Earle, *Graphics & Geometry 3*, Creative Publishing. Supplies and material: Mechanical pencil .5mm, Erasers, Irregular curves, Compass, 45 and 30/60 degree Triangles, Protractors, Architect’s Scale, Civil Engineer’s Scale and Metric Scale.

5. Course Learning Outcomes: After completing the course the student should be able to apply the descriptive geometry basics on creative problem solution.

6. Topics Covered: Lines, Point and Planes, Primary Auxiliary Views, Angle Between a Line and Principal Plane, Angle Between Planes, Intersection, Successive Auxiliary Views, Compass Bearing, Vertical Section and Plan Profiles, Slope and Slope Direction of a Plane, Strike and Dip, Outcrop, Distance between Lines, Distance between Line and Plane, Revolution, Vector Graphics, Graphs.

7. Class/Laboratory Schedule: Two two-hours of lecture drawing periods per week

8. Contribution of Course to Meeting the Requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x			x			x				

10. Person(s) who prepared this description and date of preparation:

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Engineering Science and Materials

COURSE SYLLABUS

- 1. Course Number and Title:** INGE 3016, Algorithms and Computer Programming
 Three credit hours, Required course
- 2. Catalog description:** Development of algorithms and their implementation in a structured high level language. Programming techniques applied to the solution of engineering and mathematical problems.
- 3. Prerequisites:** MATE3031 or MATE 3144 or MATE 3183
- 4. Textbook(s) and/or Other Required Material:** H.M. Deitel, P.J. Deitel, *C How to Program*, Fifth Edition (2007), Prentice Hall; Stephen J. Chapman, *Essentials of MATLAB Programming*, (2006) Thomson; S. Christian Albright, *Developing for Modelers: Developing Decision Support Systems with Microsoft Excel*, Second Edition, Duxbury, Thomson Learning.
- 5. Course Learning Outcomes:** After completing the course, the student should be able to apply acquired computer programming skills to the solution of engineering problems. The student will be able to: Demonstrate ability to edit, compile, and run a simple computer program in C/Matlab/Visual Basic; Demonstrate ability to write a bugs-free computer program.
- 6. Topics Covered:** Introduction to Computer Systems, Problem Analysis and Design of Algorithms, Fundamentals of a High Level Language, Control Structures, Functions, Formatted Input/Output, Arrays (One and Two Dimensional), File Processing.
- 7. Class/Laboratory Schedule:** Three hours of lecture per week
- 8. Contribution of Course to Meeting the Requirements of Criterion 5:**

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x				x						x

10. Person(s) who prepared this description and date of preparation:

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Engineering Science and Materials

COURSE SYLLABUS

1. Course Number and Title: INGE 3017, Computed Aided Graphics
 Two credit hours, Required course

2. Catalog description: Fundamentals of computer aided graphics in engineering. Description of the equipment, use of commercial solid modeling programs, modeling of geometric figures and documentation.

3. Prerequisites: None

4. Textbook(s) and/or Other Required Material: Dr. Zhang, *Engineering Design and Pro/Engineering*, College House Enterprises, LLC.

5. Course Learning Outcomes: The course provides students the opportunity to develop the skills necessary to express engineering concepts graphically as two- or three-dimensional representations. Specifically, the student will be able to:

Draw 2-dimensional objects with sufficient skill and speed that the student will prefer to use a CAD program rather than draw the object using pencil, pen, and drafting board tools. Create 3-dimensional (solid-model) objects with sufficient skill and speed that the student will prefer to create the solid model first rather than draw the object in 2 dimensions. Determine the engineering characteristics of the object (having created a solid model). These characteristics include volume, surface area, centers of gravity, and moments of inertia. Create an assembly of various solid model parts. Create the documentation necessary for the backup of the electronic representation of the object. This documentation will include the hard copy of a 2-dimensional drawing showing required views of the object (top, front, side, sections, auxiliary, and isometric), notes, dimensions, tolerances, and title block. Properly dimension, annotate, and present views in a manner that is in accordance with accepted graphics practice.

6. Topics Covered: Review of computer, server, and plotter hardware basics; Review of 2D CAD techniques; Plotting procedures; Introduction to Solid Modeling: Relationship and importance of solid modeling to CAM (Computer-Aided Manufacturing), Universal coordinate system, Maneuvering objects in space, Creating solid primitives, Creating solids with extrude and revolve, Modifying solids with union and subtract, Creating assemblies with individual models; Creating of documentation.

7. Class/Laboratory Schedule: Two two-hour of lecture laboratory per week

8. Contribution of Course to Meeting the Requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x						x				x

10. Person(s) who prepared this description and date of preparation:

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Engineering Science and Materials

COURSE SYLLABUS

- 1. Course Number and Title:** INGE 3031, Engineering Mechanics Statics
 Three credit hours, Required course
- 2. Catalog description:** Analysis of force systems; the laws of equilibrium; analysis of simple structures; distributed loads; friction; centroids and moments of inertia.
- 3. Prerequisites:** MATE 3031 or MATE 3144 or MATE 3183
- 4. Textbook(s) and/or Other Required Material:** F. P. Beer and E.R. Johnston, *Vector Mechanics for Engineers*, Eighth Edition (2007), McGraw-Hill.
- 5. Course Learning Outcomes:** Upon successful completion of this course the student shall be able to:
 Describe position, forces, and moments in terms of vector forms in two and three dimensions. Determine rectangular and nonrectangular components of a force. Determine the resultant of a system of forces. Simplify systems of forces and moments to equivalent systems. Draw complete free-body diagrams and write appropriate equilibrium equations from the free-body diagram, including the support reactions on a structure. Apply the concepts of equilibrium to evaluate forces in trusses, frames, machines, and cables. Determine the internal forces in a structure. Analyze systems that include frictional forces. Calculate centers of gravity and centroids, and moments of inertia by integration and the use of parallel axis theorem.
- 6. Topics Covered:** Review of Vector Calculus, Force Systems, Resolution of forces into components, Static Equilibrium of Particles, Moments and couples, Equivalent Force Systems, Rigid Body Equilibrium in 2D and 3D, Free Body Diagram in 2D and 3D, Center of Mass, Center of Gravity and Centroids, Distributed Load Systems, Analysis of Plane Trusses, Frames, and Machines, Internal Forces, Moment of Inertia, Friction
- 7. Class/Laboratory Schedule:** Three hours of lecture per week
- 8. Contribution of Course to Meeting the Requirements of Criterion 5:**

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x				x						

10. Person(s) who prepared this description and date of preparation:

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Engineering Science and Materials

COURSE SYLLABUS

- 1. Course Number and Title:** INGE 3032, Engineering Mechanics Dynamics.
 Three credit hours, Required course
- 2. Catalog description:** Kinematics of particles and rigid bodies; relations among force, mass and acceleration; kinetics of particles and rigid bodies; work and energy; impulse and momentum.
- 3. Prerequisites:** INGE 3031 and (FISI 3161 or FISI 3171)
- 4. Textbook(s) and/or Other Required Material:** F. P. Beer and E.R. Johnston, *Vector Mechanics for Engineers*, Eighth Edition (2007), McGraw-Hill.
- 5. Course Learning Outcomes:** Upon successful completion of this course the student shall be able to: Determine the kinematics relationships between position, velocity, and acceleration for two-dimensional motion of systems of particles and rigid bodies. Calculate the velocity and acceleration of a particle in rectangular, polar and normal/tangential coordinate systems. Relate the velocity and acceleration of points in a rigid body using the absolute and relative motion approaches. Determine the mass moments of inertia of rigid bodies. Draw free body and kinetic diagrams for particles and rigid bodies. Apply Newton's second law in two dimensions. Analyze the two dimensional motion of particles and rigid bodies using: principle of work and energy; impulse and momentum, both linear and angular.
- 6. Topics Covered:** Kinematics of Particles: Position, Velocity and Acceleration, Rectilinear Motion, Curvilinear Motion, Relative Motion; Kinematics of Rigid Bodies: Translation and Rotation, General Plane Motion; Kinetics of Particles-Newton's Laws: Equations of Motion for a Single Particle and a System of Particles, Rectilinear Motion, Curvilinear Motion; Work and Energy Method for Particles; Impulse and Momentum for Particles; Kinetics of Rigid Bodies: Equations of Motion, Inertia Quantities, Plane Motion; Work and Energy Methods for Rigid Bodies in Plane Motion; Impulse and Momentum of Rigid Bodies.
- 7. Class/Laboratory Schedule:** Three hours of lecture per week
- 8. Contribution of Course to Meeting the Requirements of Criterion 5:**

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x				x						

10. Person(s) who prepared this description and date of preparation:

COURSE SYLLABUS

1. Course Number and Title: INGE 3035, Engineering Mechanics
 Three credit hours, Required course

2. Catalog description: Analysis of force systems; the laws of equilibrium; friction; centroids and moments of inertia. Kinematics and dynamics of particles and rigid bodies.

3. Prerequisites: MATE 3031 or MATE 3144 or MATE 3183. **Corequisite:** FISI 3161 or FISI 3171

4. Textbook(s) and/or Other Required Material: F. P. Beer and E.R. Johnston, *Vector Mechanics for Engineers*, Eighth Edition (2007), McGraw-Hill

5. Course Learning Outcomes: After completing the course, the student should be able to: Describe position, forces, and moments in terms of vector forms in two and three dimensions. Determine rectangular and nonrectangular components of a force. Determine the resultant of a system of forces. Simplify systems of forces and moments to equivalent systems. Draw free body and kinetic diagrams for particles and rigid bodies. Compute support reactions on a structure. Analyze systems that include frictional forces. Calculate centers of gravity and centroids. Determine the kinematics relationships between position, velocity, and acceleration for two-dimensional motion of systems of particles and rigid bodies. Calculate the velocity and acceleration of a particle in rectangular and normal/tangential coordinate systems. Relate the velocity and acceleration of points in a rigid body using the relative motion approach. Determine the mass moments of inertia of rigid bodies. Apply Newton's second law in two dimensions. Analyze the two dimensional motion of particles and rigid bodies using the work and energy principle.

6. Topics Covered: General principles; Vector operations; Concurrent force systems; Equilibrium of particle; Equivalent force and moment systems; Distributed forces, centroids, and center of gravity; Equilibrium of rigid bodies. Kinematics of Particles; Kinetics of Particles: Newton's Laws; Equation of Motion; Kinetics of Particles: Work and Energy Methods; Kinematics of Rigid Bodies; Kinetics of Rigid Bodies: Newton's laws; Kinetics of Rigid Bodies: Work and Energy Methods.

7. Class/Laboratory Schedule: Three hours of lecture per week

8. Contribution of Course to Meeting the Requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x				x						

10. Person(s) who prepared this description and date of preparation:

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Engineering Science and Materials

COURSE SYLLABUS

- 1. Course Number and Title:** INGE 3045, Materials Science for Electrical Engineers
 Three credit hours, Required course
- 2. Catalog description:** Principles that determine the properties of conductors, semiconductors, and insulators. Electromechanical properties; diffusion, electrical conduction, thermal conduction; magnetic and optical properties.
- 3. Prerequisites:** QUIM 3002. **Corequisite:** FIS1 3162 or FIS1 3172
- 4. Textbook(s) and/or Other Required Material:** Donald R. Askeland, Pradeep Phule, *The Science and Engineering of Materials*, Fifth Edition, Thomson Books
- 5. Course Learning Outcomes:** After completing the course, the student should be able to: Characterize structure-property performance relationship. Identify the structure of different types of materials. Describe mechanical, thermal, electrical, and magnetic behavior of metals, polymers, and ceramics. Select materials such as conductors, semiconductors, insulators, magnetic and electro-optic materials for various electric and electronic applications.
- 6. Topics Covered:** Introduction, Classification of Engineering Materials, Structure. Property-Performance relationship. Atomic Structure, Interatomic Bonds, and their Effect on Properties. Crystal Structure, X-ray Diffraction. Imperfections in Crystals, Grain Structure, Microstructure. Atomic Diffusion, Fick's Laws. Industrial Application. Electrical and Thermal Properties of Metals, Insulators, and Dielectrics.
- 7. Class/Laboratory Schedule:** Three hours of lecture per week
- 8. Contribution of Course to Meeting the Requirements of Criterion 5:**

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x			x	x						x

10. Person(s) who prepared this description and date of preparation:

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Engineering Science and Materials

COURSE SYLLABUS

1. Course Number and Title: INGE/INME 3809, Creative Design I
 Three credit hours, Required course

2. Catalog description: Introduction to the underlying principles and methodologies of engineering graphics communications, as a tool for the solution of engineering problems: Fundamentals of graphic visualization, sketching, PC-based Computer-Aided-Design (CAD), and technical presentations. An introduction to computer-aided-design software will include principles of parametric solid modes of mechanical parts and assemblies including dimensions and tolerances. Solid modeling is the tool for visualization, and analysis of engineering problems.

3. Prerequisites: None

4. Textbook(s) and/or Other Required Material: A. Guangming Zhang, *Engineering Design and Pro/ENGINEERING*, Wildfire, Knoxville, 3.0, 2006, College House Enterprises, LLC; B. James H. Earle, *Graphics Technology*, Pearson Prentice Hall.

5. Course Learning Outcomes: After completing the course, the student should be able to: Work with engineering drawings. Be able to communicate ideas graphically. Identify the engineering design process. Develop graphics solutions through commercial software tools to engineering problems. Be proficient in using commercial software in computer-aided drafting.

6. Topics Covered: Introduction to engineering design, Fundamentals of 3-dimension sketching, Introduction to CAD software (2 and 3 dimensional), Creation of solid models of parts, Creation of assemblies of model parts, Creation of documentation drawings, Creation and orientation of drawing views, Fundamentals of dimensioning and tolerancing, Reading engineering drawings, Design projects, Oral defense of project to class.

7. Class/Laboratory Schedule: Two hours of lecture and one two-hour laboratory per week

8. Contribution of Course to Meeting the Requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x				x		x				x

10. Person(s) who prepared this description and date of preparation:

University of Puerto Rico
Mayagüez Campus
College of Engineering
Department of Engineering Science and Materials

COURSE SYLLABUS

1. Course Number and Title: INGE 4001, Engineering Materials
Three credit hours, Required course

2. Catalog description: A study of the basic principles that govern the properties and behavior of engineering materials; atomic structures, interatomic forces, amorphous and crystalline structures; phase transformations; mechanical properties; the study of the capabilities and limitations of different materials; metals, polymers, ceramics and composites; introduction to corrosion.

3. Prerequisites: (QUIM 3002 or QUIM 3042) and (FISI 3161 or FISI 3171)

4. Textbook(s) and/or Other Required Material: Donald R. Askeland, Pradeep Phule, *The Science and Engineering of Materials*, Fifth Edition, Thomson Books

5. Course Learning Outcomes: After completing the course, the student should be able to: characterize structure-property-performance relationship, distinguish the structure of different types of materials, specify microstructure of an alloy from phase diagrams, select materials for various engineering applications, establish how failures occur in materials and how to prevent them, describe corrosion of materials and how to prevent it.

6. Topics Covered: Introduction, Classification of Engineering Materials, Structure. Property -Performance relationship. Atomic Structure, Interatomic Bonds and their Effect on Properties. Crystal Structure, X-ray Diffraction. Imperfections in Crystals, Grain Structure, Microstructure Atomic Diffusion, Fick's Laws-Industrial Applications. Strengthening Mechanisms, Strain-hardening, Solid Solution Strengthening, Dispersion Strengthening and Precipitation Hardening. Heat treatments. Mechanical and Physical Properties, Testing, Fatigue & Fracture Phase Diagrams, Phase Rule, Lever Rule and Micro-structures of Alloys. Specific Engineering Materials: Ferrous and Non-ferrous Alloys. Polymers. Ceramics. Composites.

7. Class/Laboratory Schedule: Three hours of lecture per week

8. Contribution of Course to Meeting the Requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x			x	x						x

10. Person(s) who prepared this description and date of preparation:

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Engineering Science and Materials

COURSE SYLLABUS

- 1. Course Number and Title:** INGE 4011, Mechanics of Materials I
 Three credit hours, Required course
- 2. Catalog description:** Stresses and strains due to axial, torsional, and bending loads; shear and moment diagrams.
- 3. Prerequisites:** INGE 3031 and (MATE 3032 or MATE 3184)
- 4. Textbook(s) and/or Other Required Material:** R.C. Hibbeler, *Mechanics of Materials*, Seventh Edition (2008), Pearson Prentice Hall
- 5. Course Learning Outcomes:** Upon completion of this course, the student shall be able to: Define the concepts of stress, strain due to elastic and plastic deformations. Identify the mechanical properties of Materials. Apply Hooke's law and know its limitations. Calculate stress (normal and shear) in a structure component loaded in various ways. Analyze axially loaded members. Use stress concentration factors to find stresses in axially loaded members. Analyze deformations in structures due to thermal effects. Determine stresses and/or strains in torsional member. Write equations of shear and bending moment in terms of position and draw the corresponding diagrams for beams subjected to some combination of concentrated loads, distributed loads, and moments. Calculate normal and shearing stresses in beams. Design members using strength criteria.
- 6. Topics Covered:** Concepts of stress and strain, Mechanical Properties of Materials, Linear Elasticity and Hooke's Law, Axially Loaded Members, Statically Indeterminate Members, Temperature Effects, Torsion of Circular Bars, Power Transmission, Statically Indeterminate Torsional Members, Shear Forces and Bending Moments Equations in Beams, Shear Force and Bending Moment Diagrams, Normal Strains and Stresses in Beam, Design of Beams for Bending Stresses, Shear Stresses in Beam.
- 7. Class/Laboratory Schedule:** Three hours of lecture per week
- 8. Contribution of Course to Meeting the Requirements of Criterion 5:**

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x		x		x						

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COURSE SYLLABUS

1. Course Number and Title: INGE 4012, Mechanics of Materials II
 Three credit hours. Required course

2. Catalog description: Analysis of statically determinate and indeterminate beams; stresses due to combined loads; stress and strain transformation; column theory.

3. Prerequisites: INGE 4011 and (MATE 3063 or MATE 3185)

4. Textbook(s) and/or Other Required Material: R.C. Hibbeler, *Mechanics of Materials*, Seventh Edition (2008), Pearson Prentice Hall

5. Course Learning Outcomes:

Upon completion of this course, the student shall be able to: Calculate the principal stress and strains in a structure loaded in various ways. Solve problems using stress transformation and Mohr's circle. Apply Hooke's law for plane stress and plane strain. Calculate stresses in thin-walled spherical or cylindrical pressure vessels. Calculate the stresses produced by combined axial, bending and torsional loads. Calculate the deflections of statically determinate beams, using the elementary differential equations of the deflection curve, superposition, moment-area method, energy methods, and Castigliano's theorem. Calculate the reactions and deflections of statically indeterminate beams, using the solution of the elementary differential equation of the deflection curve, and superposition. Apply Euler's equation to solve buckling and stability problems for various end conditions. Analyze columns subjected to eccentric axial loads.

6. Topics Covered: Stress and Strain Transformations, Plane Stress and Plane Strain, Principal Stresses, Mohr's Circle for Plane Stress, Hooke's Law for Plane Stress, Pressure Vessels, Combined Loadings, Deflections of Elastic Beams, Superposition Method, Energy Methods: Castigliano's Theorem, Statically Indeterminate Beams, Buckling and Stability, Columns.

7. Class/Laboratory Schedule: Three hours of lecture per week

8. Contribution of Course to Meeting the Requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x		x		x						

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COURSE SYLLABUS

1. Course Number and Title: INGE 4015, Fluid Mechanics
 Three credit hours, Required course

2. Catalog description: Elements of mechanics of fluids and fluid statics. Development of the fundamental equations of fluid mechanics and its applications. Introduction to dimensional analysis and similitude. Motion of ideal and real fluids including internal and external viscous flows. Introduction to the use of hydraulic machinery.

3. Prerequisites: INGE 3032 and (MATE 3063 or MATE 3185)

4. Textbook(s) and/or Other Required Material: Munson, B. R., Young, D. F. and Okiishi, T. H., *Fundamentals of Fluid Mechanics*, Fifth Edition (2006), John Wiley & Sons Inc.

5. Course Learning Outcomes: The Fluid Mechanics course aims at the following educational objectives: Knowledge and understanding of the definitions of the most important fluid properties in engineering applications. Develop understanding and providing analytical tools to solve problems of forces on submerged surfaces. Develop basic understanding of the fundamental equations of fluid mechanics. Apply the fundamental equations of fluid mechanics to solve fluid flow problems including: Analysis and design of simple pipe systems; Analysis of hydrodynamic forces in submerged objects; Introduction of turbomachinery in fluid systems.

6. Topics Covered: Basic Definitions and Fluid Properties; Fluid Statics; Hydrostatic Forces on Submerged Surfaces; Fluids in Motion: Dynamics of Fluid Particles, Bernoulli's Equation; Fundamental Equations: System and Control Volume Definitions, Reynolds Transport Theorem, Mass Conservation, The Energy Equation, Linear Momentum Equation, Angular Momentum Equation; Dimensional Analysis and Similitude; Internal Flows: Developed Flow, Laminar Flow in Pipes, Turbulent Flow in Pipes, Energy Losses in Pipes, Pipe Systems with Pumps and Turbines, Uniform Turbulent Flow in Open Channels; External Flows: Drag and Lift Forces, Flow Separation, Laminar Boundary Layer Flow, Turbulent Boundary Layer Flow, Von Karman Solution of Boundary Layer Flows; Compressible Flow: Isentropic Flow.

7. Class/Laboratory Schedule: Three hours of lecture per week

8. Contribution of Course to Meeting the Requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x				x						

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COURSE SYLLABUS

- 1. Course Number and Title:** INGE 4016, Fluid Mechanics Laboratory
 One credit hour, Required course
- 2. Catalog description:** Laboratory work supplementing classroom instruction in mechanics of fluid phenomena, measuring devices and techniques, and the testing of fluid machinery.
- 3. Prerequisites:** None, **Corequisite:** INGE 4015
- 4. Textbook(s) and/or Other Required Material:** Walter Silva, *Fluid Mechanics Laboratory Manual*
- 5. Course Learning Outcomes:** Experimentation, observation, and analysis of physical phenomena in Fluid Mechanics. Training students in measurement of the physical properties of fluids. Provide experience in collection, analysis, interpretation, and presentation of experimental data. Precision analysis and equipment limitations.
- 6. Topics Covered:** Hydrostatic forces on submerged surfaces, Error analysis and uncertainty in experimental measurements, Discharge and flow velocity measurements, Friction losses in closed conducts, Boundary layer flow, Drag forces in submerged bodies, Hydraulic turbomachinery (pumps/turbines), Sharp crested weirs, Isentropic flow in nozzles, Hydraulic jump.
- 7. Class/Laboratory Schedule:** One three-hour laboratory period per week
- 8. Contribution of Course to Meeting the Requirements of Criterion 5:**

Math	Basic Science	General	Engineering Topic
			x

9. Relationship of Course to Program Outcomes:

a	b	c	d	e	f	g	h	i	j	k
x	x		x	x		x				x

10. Person(s) who prepared this description and date of preparation: