The University of Arizona

ARIZONA UNIVERSITY SYSTEM
CHIEF ACADEMIC OFFICERS GUIDELINES
FOR
REQUEST FOR IMPLEMENTATION AUTHORIZATION
FOR NEW ACADEMIC DEGREE PROGRAM
[UNIQUE PROGRAM]

Directions:

1. Provide information regarding the proposed program in the format requested on the attached pages.
2. Obtain signatures of the proposed unit administrator and department or committee head and college dean or Director of GIDPs. In some situations, signatures of more than one dean or department head may be required. If the planned program requires commitment of resources from other than the initiating unit, the signature of the collaborating department/committee head and collaborating college dean is also required. Please add additional signature pages if needed. If you have any questions, please contact Patti J. King, CCIT 337, 621-4107.
3. Forward the original and one copy to the college office for the dean’s signature and retain a copy for departmental files.
4. The dean should forward the original to Academic Programs, Attn: Patti J. King, CCIT 337, and retain the remaining copy for college files. An electronic version of the documents with appropriate signatures is preferred but not required. Only the signature page should be submitted as a PDF.
5. Documents must be submitted in a timely manner to move through the campus/tri-university/Arizona Board of Regents approval process. UA campus protocols include subcommittee review of the appropriate Undergraduate/Graduate Council; full Undergraduate/Graduate Council review; Provost Management Group review; and Academic Council (deans) review; Instruction and Curriculum Policy Committee or the Faculty Senate and the Faculty Senate. Once through the UA campus protocols, proposals are sent by the Provost’s Office for review to the Chief Academic Officers at Arizona State University and Northern Arizona University as well as to the Board staff at the Arizona Board of Regents, for final review prior to submission to the Arizona Board of Regents for formal approval.
6. Program uniqueness or duplication is determined by means of Classification of Instruction (CIP) codes. Please contact Patti J. King at 621-4107 for details or email pattik@u.arizona.edu for assistance in determining the proper CIP code for the proposed new program before completing this request. She can provide a list of programs (if any) which share the same code within the Arizona University System and assist you with determining unique or duplicative status of the proposed program.

Complete proposal packet consists of:

1. **Signature cover page with all appropriate signatures** - Please include additional signature pages if needed. The proposal will not be forwarded for review without all appropriate signatures being present.
2. **Proposal Document** - Respond to each item individually in using “not applicable” where appropriate.
3. **Executive Summary** - Respond to each item individually using “not applicable where appropriate. Be as concise as possible while providing key points of the proposal. The Executive Summary is submitted to ABOR for inclusion in meeting documents.

NOTE: The establishment of any Academic Degree Program requires approval by the Arizona Board of Regents prior to announcement and implementation. See ABOR Policy 2-203.
The University of Arizona

ARIZONA UNIVERSITY SYSTEM
CHIEF ACADEMIC OFFICERS GUIDELINES
FOR
REQUESTS FOR IMPLEMENTATION AUTHORIZATION
FOR NEW ACADEMIC DEGREE PROGRAM - UNIQUE

SIGNATURE COVER PAGE

Initiating college, department, or committee:

__Department of Systems & Industrial Engineering______________________________

Title of this proposal: ____Master of Science Engineering Management__________

Unit Administrator: (name and title) __K. Larry Head- Department Head__________

Signature: ____________________________ Date:______________________________

College Dean:________________________ Date:______________________________
(Signature)
I. PROGRAM NAME AND DESCRIPTION AND CIP CODE

A. DEGREE(S), DEPARTMENT AND COLLEGE AND CIP CODE
MS Engineering Management
Systems & Industrial Engineering
College of Engineering
CIP Code: 15.1501

B. PURPOSE AND NATURE OF PROGRAM
The MS in Engineering Management is designed for graduate engineers and scientists aspiring to advance into management careers within technological organizations. This Program will roll out as both Distance Education program to accommodate the demand of engineers and scientists in the workplace and a classroom Program.

C. PROGRAM REQUIREMENTS -- List the program requirements, including minimum number of credit hours, required courses, and any special requirements, including theses, internships, etc.
The MS Engineering Management is proposed to be a minimum 30 credit hour graduate degree. 18 credit hours are required courses in the major:

- SIE 567 Financial Modeling for Innovation 3 units
- SIE 515 Technical Sales & Marketing 3 units
- SIE 522 Decision Making for Managers 3 units
- SIE 557 Project Management 3 units
- ENGR 554 Law for Engineers & Scientists 3 units
- ENGR 520R Innovation Principles & Environments 3 units

Students may elect either a 3 or 6 credit Project Option or a 6 credit Thesis Option. The remaining elective credits will be selected with the approval of an advisor and the Graduate Study Committee.

D. CURRENT COURSES AND EXISTING PROGRAMS -- List current course and existing university programs which will give strengths to the proposed program.
Existing courses offered by the department of Systems & Industrial Engineering comprise most of the courses required for this degree program. Strategic collaborations with the McGuire Entrepreneurship Program in the Eller College of Management offer significant opportunities for new venture development. Current courses include:

- SIE 567 Financial Modeling for Innovation 3 units
- ENGR 554 Law for Engineers & Scientists 3 units
- SIE 531 Simulation Modeling & Analysis 3 units
- SIE 540 Survey of Optimization Methods 3 units
- SIE 543 Game Theory 3 units
- SIE 583 Computer Integrated Manufacturing Systems 3 units
- ENGR 520R Innovation Principles & Environments 3 units
- SIE 520 Stochastic Modeling I 3 units

E. NEW COURSES NEEDED -- List any new courses which must be added to initiate the program; include a catalog description for each of these courses.
New courses required for this degree program include:
F. REQUIREMENTS FOR ACCREDITATION -- Describe the requirements for accreditation if the program will seek to become accredited. Assess the eligibility of the proposed program for accreditation.

The MS Engineering Management Program will seek accreditation from the Academic Standards committee of the American Society of Engineering Management (ASEM). The undergraduate degree Program (BS Engineering Management) commenced in 2002 and has grown into the largest ABET accredited Program in the country. We expect the MS Program in Engineering Management to be fully accredited by relevant academic standards.

II. STUDENT AND PROGRAM LEARNING OUTCOMES AND ASSESSMENT

A. What are the intended student outcomes, describing what students should know, understand, and/or be able to do at the conclusion of this program of study?

Students completing the MS Engineering Management degree Program will be able to apply the methodology and tools of this engineering discipline to manage complex technology-based Projects. Most engineers graduate with limited business related skills which limit advancement opportunities in technology based companies. Students are expected to learn technology management skills including financial modeling, technical marketing, optimization theory, law, and quality engineering.

B. Provide a plan for assessing intended student outcomes.

The plan for assessing student outcomes will measure both employer and student satisfaction with the acquired knowledge gained from the Program and the increase in job opportunities afforded our graduates.

C. What are the intended program outcomes, describing what the program is intended to accomplish.

The Program is intended to produce graduates who are able to assume management responsibility in technology based organizations. This Program is in response to student and employer demand for a Program to teach management skills to graduate engineers with little or no background in business related knowledge.

D. Provide a plan for assessing intended program outcomes.

The assessment plan for the Program will largely focus on the realization of the demand for this body of knowledge. We expect considerable interest in this degree Program from engineers in the workforce who are seeking the knowledge to advance into management positions. Growth of this Program in its classroom and distance education components will illustrate the intended outcome of increasing demand.

III. STATE'S NEED FOR THE PROGRAM
This program fulfills the needs of the State and Southern Arizona by educating graduate engineers with the business knowledge to successfully manage technology based companies. Improving the commercialization success of new technology development is a key objective of this degree Program.

B. IS THERE SUFFICIENT STUDENT DEMAND FOR THE PROGRAM? --Explain and please answer the following questions.
We believe there is significant demand for an MS Engineering management degree. Inquiries about an MS Program are increasing for both traditional classroom format and Distance education format. R. D. Eckhoff, Director of the MS Engineering Program, fields a significant volume of inquiries related to this proposed Program. A new graduate course offered for the 1st time this Fall 2009 has an enrollment of 34. Of these 34 students, 10 are taking the class Distance Education via the Web. SIE 567 “Financial Modeling for Innovation” is one of the core classes of this new Program.

1. What is the anticipated student enrollment for this program? (Please utilize the following tabular format).

<table>
<thead>
<tr>
<th>5-YEAR PROJECTED ANNUAL ENROLLMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Student Majors</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

2. What is the local, regional and national need for this program? Provide evidence of the need for this program. Include an assessment of the employment opportunities for graduates of the program during the next three years.
Graduate Programs in Engineering management far outnumber undergraduate programs across the country. The UA undergraduate Program has grown to become the largest ABET accredited Program in the country in just 5 years. We expect similar results from a graduate program. Until this recession, graduates of our undergraduate Program enjoyed considerable job placement success. Many students accepted into our graduate Program will be employed engineers in the Arizona and surrounding states workforce and, as such, will increase their job advancement opportunities within existing companies.

3. Beginning with the first year in which degrees will be awarded, what is the anticipated number of degrees that will be awarded each year for the first five years? (Please utilize the following tabular format).

<table>
<thead>
<tr>
<th>PROJECTED DEGREES AWARDED ANNUALLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Degrees</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
IV. APPROPRIATENESS FOR THE UNIVERSITY -- Explain how the proposed program is consistent with the University mission and strategic direction statements of the university and why the university is the most appropriate location within the Arizona University System for the program.

The MS Engineering Management is consistent with the University’s goal to advance fundamental knowledge and applied knowledge to the benefit of the citizens of the State of Arizona. This Engineering Program balances the quest for research discovery and theory with the practicable knowledge necessary to transform such discovery into commercial opportunity. The Program is uniquely positioned at the UA to augment its already strong existing ties with the McGuire Entrepreneurship Program and the Center for Innovation at the UA Science & Technology Park.

V. EXISTING PROGRAMS AT OTHER CAMPUSES

A. EXISTING PROGRAMS IN ARIZONA –

1. For a unique, non-duplicative, program please provide a statement to the effect that there are no existing programs at other Arizona public universities that duplicate the proposed program.

   There are no existing programs at any of Arizona’s public universities that duplicate the proposed Program.

2. Other Institutions—If this program is not currently offered at the same academic level by private institutions in the state of Arizona, provide a statement to that effect. If a similar program is currently offered by private institutions, list all programs and indicate whether the institution and the program are accredited. (A list of private institution can be provided by ABOR staff. Please contact Stephanie Jacobson, stephanie.jacobson@asu.edu, (602) 229-2529 for assistance.

   There is no similar program offered by any private institution in the State of Arizona.

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>PRIVATE INSTITUTION</th>
<th>NCA ACCREDITATION? (Y or N)</th>
<th>PROGRAM ACCREDITATION? (Y or N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. PROGRAMS OFFERED IN OTHER WICHE STATES

1. Identify WICHE institutions that currently offer this program. If appropriate, briefly describe the program(s). (Please utilize the following tabular format).

<table>
<thead>
<tr>
<th>PROGRAMS OFFERED IN OTHER WICHE STATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRAM</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
### VI. EXPECTED FACULTY AND RESOURCE REQUIREMENTS

#### A. FACULTY

1. **Current Faculty** -- List the name, rank, highest degree and estimate of the level of involvement of all current faculty who will participate in the program. If the proposed program is at the graduate level, also list the number of master's theses and doctoral dissertations each of these faculty has directed to completion. Attach a brief vita for each faculty member listed.

Current Faculty includes:

<table>
<thead>
<tr>
<th>NAME</th>
<th>RANK</th>
<th>DEGREE</th>
<th>MS Theses</th>
<th>PhD Dissertations</th>
<th>Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Terry Bahill</td>
<td>Professor</td>
<td>PhD</td>
<td>48</td>
<td>8</td>
<td>Medium</td>
</tr>
<tr>
<td>Guizin Bayraksan</td>
<td>Assistant Professor</td>
<td>PhD</td>
<td>1</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td>Larry Head</td>
<td>Research Professor</td>
<td>PhD</td>
<td>0</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td>Wei Lin</td>
<td>Associate Professor</td>
<td>PhD</td>
<td>6</td>
<td>1</td>
<td>Medium</td>
</tr>
<tr>
<td>Jian Liu</td>
<td>Assistant Professor</td>
<td>PhD</td>
<td>0</td>
<td>0</td>
<td>Low</td>
</tr>
<tr>
<td>Leo Lopes</td>
<td>Assistant Professor</td>
<td>PhD</td>
<td>1</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td>Young-Jun Son</td>
<td>Associate Professor</td>
<td>PhD</td>
<td>16</td>
<td>4</td>
<td>Medium</td>
</tr>
<tr>
<td>Ferenc Szidarovszky</td>
<td>Professor</td>
<td>PhD</td>
<td>30</td>
<td>10</td>
<td>High</td>
</tr>
<tr>
<td>Jane Hunter</td>
<td>Adj. Asst. Professor</td>
<td>PhD</td>
<td>0</td>
<td>0</td>
<td>High</td>
</tr>
<tr>
<td>Michael Arnold</td>
<td>Professor of Practice</td>
<td>MS</td>
<td>0</td>
<td>0</td>
<td>High</td>
</tr>
</tbody>
</table>
2. **Additional Faculty** -- Describe the additional faculty needed during the next three years for the initiation of the program and list the anticipated schedule for addition of these faculty.
   Additional Faculty and their start dates include:
   - Associate/Assistant Professor: 8/11
   - Senior Lecturer: 1/11

3. **Current FTE Student and Faculty** -- Give the present numbers of FTE students and FTE faculty in the department or unit in which the program will be offered.
   The Department of Systems & Industrial Engineering is comprised of the following: (2008-2009 Data)
   - Current FTE Students:
     - Undergraduates: 147.5
     - Graduates: 62.1
     - Total FTE Students: 209.6
   - Current FTE Faculty: 9.8

4. **Projected FTE Students and Faculty** -- Give the proposed numbers of FTE students and FTE faculty for the next three years in the department or unit in which the program will be offered.
   
<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTE Students:</td>
<td>222.9</td>
<td>232.3</td>
<td>249.0</td>
</tr>
<tr>
<td>FTE Faculty:</td>
<td>10.8</td>
<td>11.8</td>
<td>11.8</td>
</tr>
</tbody>
</table>

C. **LIBRARY**

1. **Current Relevant Holdings** -- Describe the current library holdings relevant to the proposed program and assess the adequacy of these holdings.
   Not Applicable

2. **Additional Acquisitions Needed** -- Describe additional library acquisitions needed during the next three years for the successful initiation of the program.
   None Required.

D. **PHYSICAL FACILITIES AND EQUIPMENT**

1. **Existing Physical Facilities** -- Assess the adequacy of the existing physical facilities and equipment available to the proposed program. Include special classrooms, laboratories, physical equipment, computer facilities, etc.
   Existing Facilities are adequate to support this degree Program.

2. **Additional Facilities Required or Anticipated** -- Describe physical facilities and equipment that will be required or are anticipated during the next three years for the proposed program.
   None Required.

E. **OTHER SUPPORT**
1. **Other Support Now Available -- List support staff, university and non-university assistance.**
   Existing Support staff including Melissa Sarmiento and Linda Cramer is now available to support this Program.

2. **Other Support Needed, Next Three Years -- List additional staff needed and other assistance needed for the next three years.**
   Additional support staff: None Required

VII. **FINANCING**

A. **SUPPORTING FUNDS FROM OUTSIDE SOURCES -- List.**
   The MS Engineering Management degree is expected to attract interest from industry and result in significant Distance Education revenue. SIE 567, a core class of this new degree Program, has 34 graduate students enrolled in Fall of 2009. 10 of these students are taking this class via Distance Education. We believe these enrollment figures are significant considering that this is the 1st time SIE 567 has been offered.

B. **NEW ACADEMIC DEGREE PROGRAM BUDGET PROJECTIONS FORM –**
   We do not anticipate any incremental cost for this Program. The addition of faculty members noted above will result from filling vacant lines of departing faculty. The Engineering Management Program is considered to be a strategic direction for the department of Systems & Industrial Engineering to accommodate the needs of industry in Arizona and position the department for growth in the future.

VIII. **OTHER RELEVANT INFORMATION --None.**
### Executive Summary

**Request for Authorization to Implement a New Degree Duplicative Program**

<table>
<thead>
<tr>
<th>Program Name/Degree</th>
<th>Engineering Management / MS Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Request</strong></td>
<td>New Graduate Degree Program</td>
</tr>
<tr>
<td><strong>Requested by</strong></td>
<td>Michael J. Arnold- Director, Engineering Management Program</td>
</tr>
<tr>
<td><strong>CIP Code</strong></td>
<td>15.1501</td>
</tr>
<tr>
<td><strong>Purpose of Program</strong></td>
<td>Respond to demand of marketplace to offer a graduate Program in Engineering Management.</td>
</tr>
</tbody>
</table>

**Learning Outcomes and Plan for Assessment**

Graduate Engineers will acquire business knowledge to manage technology based organizations. Assessment will be based primarily on the feedback of employers of the quality of the Program.

<table>
<thead>
<tr>
<th>Projected Student Demand</th>
<th>5-year projected annual enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

**Job Prospects**

Engineers anticipating advancement into management positions require this knowledge to be successful. Job Prospects are high in part due to the fact that many students will pursue this degree while employed.

**Sources of Funding**

Distance Education fees.

<table>
<thead>
<tr>
<th>Budget Summary Bottom Line</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Increments</strong></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>+ Previous Year</td>
<td>$1,357,320</td>
<td>$1,357,320</td>
<td>$1,357,320</td>
</tr>
<tr>
<td><strong>Total Yearly Budget</strong></td>
<td>$1,357,320</td>
<td>$1,357,320</td>
<td>$1,357,320</td>
</tr>
</tbody>
</table>

### ADDITIONAL INSTRUCTION FOR HOW TO FORMAT THE REPORT

In order to ensure consistency, this format should be followed. Leave a one-inch margin at the top for pagination of documents at the ABOR Office.

*Academic Program_Implement_Unique_Packet_Revised_4-18-2006*
Curriculum Vitae
Michael J. Arnold

EXPERTISE:

EXPERIENCE:
Engineering College, Department of Systems & Industrial Engineering, University of Arizona, Tucson, Arizona
Director- Engineering Management Program
August 2007 – Present
Associate Director- Engineering Management Program
August 2004 – July 2007

Tucson Technology Incubator, Inc., University of Arizona Science & Technology Park, Tucson, Arizona
Vice President- September 2002 – January 2003
Responsible for guiding incubator client companies towards the creation of successful business plans including attracting funding and launch.

Eller College of Management, University of Arizona, Tucson, Arizona
Associate Director, Entrepreneurship Program 1998 – 2001
Responsible for directing the entrepreneurship program for graduate and undergraduate students including business plan preparation and presentation.

Modular Mining Systems, Inc., Tucson, Arizona
Chief Executive Officer 1978 – 2000
Mike founded Modular in 1978 in response to market demands for mine management technology. Modular's flagship technology, a computerized mine management system, grew to a dominant 86% market share. He was responsible for the strategic planning leading to Modular's acquisition in 1996 by Komatsu Inc., a major Japanese manufacturer of mining and construction equipment.

University of Arizona, Tucson, Arizona
Instructor of Chemical Engineering 1976 – 1978

EDUCATION:
M.S. Chemical Engineering, University of Arizona, May 1977
B.S. Chemical Engineering, University of Arizona, May 1972

CONTINUING EDUCATION:
Symposium for Entrepreneurship Educators - 1986, 1987 &1998,
Price-Babson College Fellows Program, Wellesley, Massachusetts.

SERVICE:
Treasurer – Community Finance Corporation, Tucson, AZ 1995 - Present
Adjunct Instructor of Business, Karl Eller Center, University of Arizona, 1987 - 1990
Anheuser-Busch Entrepreneur in Residence, Karl Eller Center, College of Business and Public Administration - 1996/1997 academic year
Member - Industrial Advisory Council, College of Engineering and Mines, University of Arizona, 1986 - Present
Board Member - Greater Tucson Economic Council, 1991 - 1995
Member - US Department of Commerce Arizona District Export Council, 1990 - Present
Member – Business Development Finance Corporation of Tucson, 1988 – Present
Member – Professional MS Board, College of Science, University of Arizona, 1999 – Present
Chairman- daVinci Circle of the College of Engineering, University of Arizona, 2005 - present

AWARDS:
President’s “E” Award to recognize export sales growth - 1992
U.S. Department of Commerce, Arizona Outstanding Export Award for 1987
Named #180 on the INC. Magazine List of the 500 fastest growing private businesses in the United States for 1987

SOCIETIES:
American Society for Engineering Management, Member
American Institute of Chemical Engineers, Member
American Institute of Mining Engineers, Member

PUBLICATIONS:
NAME: A. Terry Bahill

POSITION TITLE: Professor of Systems Engineering

INSTITUTION AND LOCATION | DEGREE (if applicable) | YEAR(s) | FIELD OF STUDY
--- | --- | --- | ---
University of Arizona | BSEE | 1967 | Electrical Engineering
San Jose State University | MSEE | 1970 | Electrical Engineering
University of California, Berkeley | PhD | 1975 | Electrical Engineering

A. Positions

1967-1971 | Lieutenant, United States Navy
1971-1975 | Graduate student and postdoctoral fellow, University of California (Berkeley)
1976-1984 | Assistant and Associate Professor of Electrical and Biomedical Engineering, Carnegie Mellon University
1977-1984 | Adjunct Assistant and Associate Professor of Neurology, University of Pittsburgh Medical School
1984-present | Professor of Systems and Industrial Engineering, University of Arizona, Tucson
1986-present | President of Bahill Intelligent Computer Systems

Honors

A photograph of Bahill was placed in the Baseball Hall of Fame exhibit Baseball As America, 2002
Fellow of the International Council on Systems Engineering (INCOSE), 1998
Fellow of the Institute of Electrical and Electronics Engineers (IEEE), 1992
Sandia National Laboratories Gold President's Quality Award, 2001.
Salpointe High School Distinguished Alumni Hall of Fame, 2004
Raytheon Engineering Fellow, 2000

B. Selected peer-reviewed publications (in chronological order).

Bahill has over 100 peer-reviewed publications and 200 other publications. Only some of his recent publications are listed here.


C. Research Support.

**Ongoing Research Support**

AFOSR/MURI F49620-03-1-0377. Cole Smith (PI) 7/1/2003 to 6/30/2008

Title: Predicting and Prescribing Human Decision Making Under Uncertain and Complex Scenarios

The overall goal of this research is to build an empirical model to emulate the behavior of human decision makers under a broad array of practical operating scenarios.

Role: Co-PI
Guzin Bayraksan

Education

- B.S., Industrial Engineering, Bogazici University, Istanbul, Turkey, 1998.
- M.S., Operations Research and Industrial Engineering, University of Texas at Austin, 2000.
- Ph.D., Operations Research and Industrial Engineering, University of Texas at Austin, 2005.

Academic and Professional Appointments

- Assistant Professor, Department of Systems and Industrial Engineering, University of Arizona, 2005-Present.
- Analyst, Research and Development Department, United Airlines, 2001.
- Research Assistant, Teaching Assistant, Operations Research and Industrial Engineering, University of Texas at Austin, 2002-2005.
- Research Assistant, Management Science and Information Systems, University of Texas at Austin, 1999-2000.

Selected Significant Publications

- B.D. Keller and G. Bayraksan, “Quantifying Operational Risk in Financial Institutions,” INFORMS Transactions on Education, under review. (This has won the INFORMS Best Case Study Award.)

Grants and Sponsored Projects

- Science Foundation Arizona,” Evaluation of Distributed Solar Generators and Storage Units via Flexible Simulation and Optimization,” $25,000. 2009 - 2010.
- GIGA Award, the University of Arizona, “Opportunities for Graduate SIE Research through Industrial Partnerships,” $26,572. 2008 - 2010.

Synergistic Activities

- Tutorial Speaker: 12th International Conference on Stochastic Programming (SPXII), Pre-Conference Tutorials, August 2010, Halifax, Nova Scotia, Canada.
- Director: the MORE (Modeling, Optimization, Research and Education) Institute, the computational optimization lab at the University of Arizona.
- Optimization Cluster Co-Chair: INFORMSWestern Regional Conference, Phoenix, AZ, 2009.
- Founding Faculty Advisor: Student Chapter of INFORMS at the University of Arizona (chapter founded in 2007).
Collaborators: G. Chung (Korea University), S. Kucukyavuz (Ohio State University), K. Lansey (University of Arizona), L. Lopes (University of Arizona)

Advisors: Ph.D.: D.P. Morton (University of Texas at Austin)
M.S.: P. Jaillet (Massachusetts Institute of Technology)

M.S.: P. Pierre-Louis

Honors and Awards
- INFORMS Best Case Study Award, 2008.
- Award for Excellence at the Student Interface, College of Engineering, University of Arizona, 2007 and 2009.
- GIGA Award, University of Arizona, 2008.
- Appointment to the Young Researcher Roundtable, INFORMS Conference on OR/MS Practice, Miami, FL, 2006.
- University of Texas Continuing Fellowship, 2004-2005.
- Presidential Scholarship, Turkey, 1994.
K. LARRY HEAD, Ph.D.

Systems and Industrial Engineering Department
The University of Arizona
P.O. Box 210020
Tucson, AZ 85721
fax: (520) 621-6555
email: larry@sie.arizona.edu

PROFESSIONAL PREPARATION

The University of Arizona Systems Engineering B.S. 1983.

APPOINTMENTS

Department Head and Associate Professor (August 2007 – present)
Research Professor (October 2003 – August 2007)
Interim Department Head. (January 2006 – August 2007), The University of Arizona, Department of Systems and Industrial Engineering.
Assistant Professor. The University of Arizona, Department of Systems and Industrial Engineering, January 1994-December 1997.

PUBLICATIONS

SYNERGISTIC ACTIVITIES

Principal Investigator. FHWA Integrated Corridor Management (ICM) Tools, Strategies, and Deployment Support. The Federal Highway Administration selected the team lead by Cambridge Systematics, Inc. to provide modeling methodology development and support for the Integrated Corridor Management initiative. As members of the Team the UA (including Yi-Chang Chiu and Mark Hichman, CEEM) is developing a methodology that considers multimodal (cars, trucks, transit and pedestrians) traffic modeling for corridors.

Principal Investigator. DARPA Urban Challenge. DARPA selected Team Scorpion (Raytheon Missile Systems – Lead, Preferred Chassis Fabrication, Inc., Tucson Embedded Systems, and iRobot) as a Track A team in the 2007 Grand Challenge. The objective is to develop an autonomous vehicle that can drive in urban traffic to complete missions that might include delivery of supplies and ammunition. The UA team included Dr. Head, SIE and Dr. Rozenblit, ECE. October 2006 – November 2007.

Co-Principal Investigator. TS09 – Measure and Field Test of Adaptive Traffic Signal Control. University of California, Berkeley, PATH. This project supports researchers at the PATH center in the testing of adaptive signal control for statewide deployment in California. The University of Arizona is providing expertise on adaptive traffic signal control, the RHODES systems, and on field deployment and testing. July 2005-December 2006.

Co-Principal Investigator. MILOS Adaptive Ramp Metering System Field Test. Arizona Department of Transportation, Arizona Transportation Research Center. The University of Arizona, in cooperation with ADOT and Siemens ITS is field testing the MILOS adaptive ramp metering system. Dr. Head is responsible for designing the system architecture, directing the software development and testing, and oversight of the field test. Phase I of the project (2005) demonstrated operational feasibility and Phase II (2006-2007) will concentrate on evaluation and algorithm improvement.

Investigator. NCHRP 3-66: Traffic Signal State Transition Logic Using Enhanced Sensor Information. Principal Investigator – Thomas Urbanik II, University of Tennessee. As a member of the project team (with D. Bullock, Purdue University; Douglas Gettman, Siemens ITS; and Rick Campbell, Railroad Controls Limited) Dr. Head lead the effort to develop an analytical model of the traffic signal controller logic, demonstrated the capability by analyzing traffic signal priority for multiple requests for priority and for railroad preemption. Dr. Head also develop a traffic signal controller architecture (using the Unified Modeling Language – UML) that serves as an organizing structure for further research and development of traffic signal controller logic.

COLLABORATORS & OTHER AFFILIATIONS

Collaborators and Co-Editors: He, Qing, Son, Yong-Jun (University of Arizona); Campbell, Rick (Railroad Controls Limited); Bullock, Darcy (Purdue University); Gettman, Douglas (Kimley-Horn & Associates); Ghaman, Raj (US DOT – Federal Highway Administration); Mirchandani, Pitu (University of Arizona); Shelby, Steven (Siemens ITS); Urbanik, Thomas (University of Tennessee)

Graduate and Postdoctoral Advisors: Schultz, Donald G. (Retired, University of Arizona)

Thesis Advisor and Postgraduate-Scholar Sponsor: He, Qing (University of Arizona); Wei, Zhiping (University of Arizona) (of a total of 8 students)
Curriculum Vitae

Jane Hunter

EDUCATION:

Ph.D. Higher Education, University of Arizona, May 2009
M.S. Engineering Management, NTU College of Engineering and Applied Science at Walden University, May 1987
B.S. Mechanical Engineering with distinction, University of Arizona, May 1982

INTERESTS:


EXPERIENCE:

College of Engineering, Department of Systems & Industrial Engineering, University of Arizona, Tucson, Arizona

Adjunct Associate Professor – College of Engineering, August 2009 thru Present
Associate Director - Engineering Management Program, August 2008 thru Present
Lecturer - College of Engineering, January 2004 thru July 2008
   Responsible for program planning and evaluation, curriculum development, course design and instruction, learning outcome assessment, student advising and mentoring, project proposal preparation and execution. Coordinate 600+ student Introduction to Engineering class.

Pima Community College, Tucson, Arizona

Adjunct Faculty - Science & Engineering, January 2003 thru December 2003
   Taught entry-level engineering course focused on engineering problem solving and the design process.

The Software Tutor, Tucson, Arizona

Software Consultant - January 1994 thru December 2002
   Established consulting firm to provide education on software applications to individuals and small businesses.

Anaquest, Inc., Madison Wisconsin

Manager of Information Technology, November 1988 thru June 1991
   Responsible for managing group of systems analysts, programmers, microcomputer specialists and computer operation function supporting all major business systems of successful pharmaceutical manufacturing company.
IBM Corporation, Madison, Wisconsin

Account Marketing Representative, August 1987 thru October 1988
Managed territory of accounts with installed IBM mid-range computer systems. Worked with customer executives and staff to develop plans to meet short and long term goals. Generated sales forecasts and executed plans to meet sales objectives.

IBM Corporation, Tucson, Arizona

Engineering/Programming Manager, September 1986 thru July 1987
Directed group of engineers, programmers and technicians in the development of sophisticated test systems and a host database for optical and magnetic storage devices under development.

IBM Corporation, Tucson, Arizona

Engineer, July 1982 thru August 1986
Designed head/tape interface in low cost, high performance magnetic recording device. Acted as primary interface between process chemists and hardware/software developers in the integration of photosensitive material in high-speed laser printers.

SERVICE AND SOCIETY MEMBERSHIPS:

Faculty Advisor, American Society for Engineering Management University of Arizona Student Chapter
Faculty Advisor, Theta Tau Engineering Fraternity, University of Arizona Chi Chapter
American Society for Engineering Management, Member
American Society of Engineering Education, Member
WEI-HUA LIN
Associate Professor
Department of Systems and Industrial Engineering
The University of Arizona
Tucson, AZ 85721, U.S.A.
Phone: (520) 621-6553
Email: weilin@sie.arizona.edu

EDUCATION
Ph.D. in Civil Engineering, University of California at Berkeley, 1995
M.S. in Mathematics, Rensselaer Polytechnic Institute, 1989
B.S. in Computer Science, Brigham Young University, 1985

RESEARCH AREAS
Traffic flow modeling, information technologies in transportation, transportation
data analysis, transportation network, analysis and modeling, freeway incident
management, application of advanced technologies in transit operations, and
application of computer simulation to transportation analysis.

TEACHING AREAS
Transportation engineering, traffic flow theory, traffic operation, logistics,
statistical analysis of transportation data, operations research and computer
applications in transportation, and transportation network analysis.

EMPLOYMENT
Associate Professor (July 2006 – present)
Department of Systems and Industrial Engineering, U. of Arizona,
Tucson, AZ.
Associate Professor (joint appointment) (July 2006 – present)
Department of Civil Engineering and Engineering Mechanics, U. of Arizona,
Tucson, AZ.
Assistant Professor (August 2001 – May 2006)
Department of Systems and Industrial Engineering, U. of Arizona,
Tucson, AZ.
Assistant Professor (January 1998 – May 2001)
Department of Civil and Environmental Engineering, Virginia Polytechnic
Institute & State University,
Blacksburg, VA.
Postdoctoral Researcher (August 1995 - August 1997)
Institute of Transportation Studies, University of California,
Berkeley, California.

COURSES OFFERED
- SIE 562: Advanced Production Control
- SIE 270: Mathematical Foundation for Systems and Industrial Engineering
- SIE 561/CE 561: Traffic Modeling and Simulation
- SIE 431/531: Simulation Modeling and Analysis
- SIE 525: Queueing Theory
- SIE 340: Deterministic Operations Research
- SIE 321: Probabilistic Models in Operations Research
- SIE 546: Algorithms for Networks and Graphs

SELECTED REFEREED JOURNAL PUBLICATIONS
  117-126.
  Approach for Signal Control of an Oversaturated Intersection, IN Transportation
  Signal Priority Control, IN ASCE Journal of Transportation Engineering, Volume
  133, No. 9, pp. 513-522.
  Signal Priority Sstems in Mixed Mode Operation, IN International Transactions

SELECTED RESEARCH AND TECHNICAL REPORTS
CURRICULUM VITAE
JIAN LIU
Department of Systems and Industrial Engineering
The University of Arizona, Tucson, AZ 85721
Tel: (520) 621-6548 Fax: (520) 621-6555
Email: jianliu@sie.arizona.edu

EDUCATION
Ph.D. Joint Ph.D. of Industrial & Operations Engineering and Mechanical Engineering, University of Michigan, April 2008
M.S. Statistics, University of Michigan, 2006
M.S. Industrial and Operations Engineering, University of Michigan, 2005
M.S. Mechanical Engineering, Tsinghua University, 2002
B.S. Precision Instrument and Mechanology, Tsinghua University, 1999

RESEARCH INTEREST
Quality, reliability engineering and applied statistics: multivariate statistics, statistical process control (SPC) and diagnosis, reliability engineering
Monitoring, diagnosis, and control of complex systems: integration of statistical analysis with engineering knowledge for diagnosis and prognostics of complex manufacturing processes using data fusion, feature extraction and signature recognition
Modeling and analysis of complex multistage processes: variation propagation modeling for multistage complex processes, variation management, product/process design for variation reduction

EMPLOYMENT
Assistant Professor, Department of Systems and Industrial Engineering, The University of Arizona, August 2008 – present

TEACHING EXPERIENCE
Instructor, taught all lectures and supervise one Teaching Assistant for course SIE430/530, “Engineering Statistics”, a 3-credit course with 35 graduate and undergraduate students enrolled, Fall 2008
Adjunct Lecturer, taught all lectures and supervise one Teaching Assistant for course IOE/STA/MFG 466, “Statistical Quality Control”, a 3-credit course with 91 graduate and undergraduate students enrolled, Fall 2007; Evaluation: Q1*: 4.30/5.0, Q2*: 4.55/5.0.
Guest Lecturer, developed a course module on Multivariate Factor Analysis with Application for course IOE566, “Advanced Quality Control”, a 3-credit graduate course on applied multivariate statistics and advance quality control; presented theoretical basis, research topics and real-practice case studies, Fall 2007
Adjunct Lecturer, taught all lectures and supervise one Teaching Assistant for course IOE/STA/MFG 466, “Statistical Quality Control”, a 3-credit course with 94 graduate and undergraduate students enrolled, Winter 2006; Evaluation: Q1: 4.00/5.0, Q2: 4.11/5.0.
Student Mentor, led four under-representative undergraduate students (Micah McCrary-Dennis, Pedro Escalona, Jerrod Begaye, and Richard Wang) in project “Stream-of-Variation Based Setup Planning for Multistage Machining Process”, an NSF RMS/ERC funded REU project, 2006
*Q1: Overall, this was an excellent course
†Q2: Overall, the instructor was an excellent teacher

PUBLICATION
Selected Refereed Journals and Transactions
RESEARCH PROPOSAL

AWARDS
1. Best Project Initiative Award, NSF Engineering Research Center for Reconfigurable Manufacturing Systems, University of Michigan, 2006
2. Outstanding Graduate Student Scholarship, Tsinghua University, P.R. China, 2000
3. Outstanding Undergraduate Student Scholarship, Tsinghua University, P. R. China, 1995-1998
Leo Lopes
Assistant Professor
Systems and Industrial Engineering, School of Sustainable Engineered Systems, University of Arizona
1127 E James E Rogers way #111, Tucson AZ 85721
Tel: +1(520)661-9478, E-mail: leo@sie.arizona.edu

Education
- PhD, Industrial Engineering and Management Sciences - Northwestern University, 2003
- MS, Industrial Engineering and Management Sciences, Northwestern University, 1999
- BS, Computer Science, Universidade Federal do Cear’a (Brazil), 1997

Chronology of Employment
2009- Senior Research Fellow, Monash University (temporary)
2004- Assistant Professor, University of Arizona (permanent, on Leave for 2009-2010)
2003-2004 Visiting Assistant Professor, University of Arizona
1997-2003 Research Assistant, Industrial Engineering and Management Sciences, Northwestern University
2000 Summer Intern, Mitsubishi Electric Research Laboratories
1997 Developer, Townsend Analytics, Chicago, IL
1997 Network Administrator, PCC Informática, (Brazil)
1995-1997 Technical Sales Agent, PCC Informática, (Brazil)

Honors and Awards
- Honors College Excellence in Teaching Award, April 2007. There were 27 nominees and 4 awardees that year university-wide.
- Faculty advisor for Senior Design BAE Award winning team, May 2007.

Refereed Journal Articles, Published or Accepted in Final Form
  
  We created the first modeling system specifically designed for Stochastic Optimization from the ground up. It introduces a modularized syntax that encourages reuse and reduces the notational effort needed to write computer versions of Stochastic Optimization Models.

- Leo Lopes, Meredith Aronson, Gary Carstensen, and Cole Smith, Optimization Support for Senior Design Project Assignments, Interfaces, Volume 38, Number 6, 448-464, 2008
  
  We discuss the implementation of a large-scale integer programming approach to assign senior design projects to students in the college of engineering. A typical year will have 300 students and 60 projects. A large number of side constraints are considered. In the paper, directed to the practice community, we discuss and illustrate complexity theory and provide examples of how simple changes in a constraint may make an easy problem become hard.

  
  We designed a near-field emitter using a diode array that achieves flat waves over a wide width.

  
  This work presented the community for the first time with the opportunity to automatically create many reformulations of Stochastic Programming (SP) instances as Linear Programming (LP) instances and provided visualization procedures to guide the expert in creating the most appropriate LP for each kind of SP based on stage or scenario decompositions.

  
  This pioneering work on XML-based standards for Linear and Integer optimization problems was extremely well-received by the optimization community. Since the 1970s, when the last design of a major standard for optimization instances had been designed, the community had been yearning for an improvement. However, vendors and academics had not been able to coalesce around any proposal. It was my leadership, in bringing together industry and academic leaders over two years, along with a major design effort along with my collaborators, and significant research into the possibilities and limitations of emerging Information Technology, that allowed this breakthrough for our community to finally arise. Since the publication of our standard, the specification has been extended by other authors to cover a large variety of classes of optimization problems and has become the backbone for support of optimization web services.
Awarded Grants and Contracts

- **Total:** $299,000
- **Leo’s total responsibility:** $85,000 (29.3%)
- **State**
  - Integration of Scripting Languages and Modeling Languages, (PI, 100% responsibility, University of Arizona through Proposition 301 Technological Innovation Initiative, $10,000, September 2003-September 2004).
  - Modeling Partially Understood Biological Networks (co-PI, 50% responsibility, The University of Arizona BIO5 Institute, $40,000, July 2006-June 2007).
- **Industry**
  - Flat Wave Radar Design (consultant, 15.9% responsibility, Waveband Corporation, $220,000, January 2005-December 2006).
  - Uniform Data Access and Web Services Facilities for Mathematical Programming Models, (PI, 100% responsibility, IBM Faculty Partnership Award, IBM Research Mathematical Sciences Department, $20,000, December 2005-December 2006).
  - GIGA: Opportunities for Graduate SIE Research through Industrial Partnerships (PI, 33% responsibility, 29,000, University of Arizona, July 2008-June 2010)

Courses Taught

**Course Description**

- SIE 545 Fundamentals of Optimization A math course covering convex analysis, optimality conditions and Lagrangian duality.
- SIE 547 Computational Optimization A math course covering numerical stability, computational complexity, and sparsity.
- SIE 540 Survey of Optimization An application oriented course covering extensive modeling with several types of optimization.
- SIE 375/377 Software for Engineers A 3rd year course covering scripting languages and their use within operations research.
- SIE 573 Principles of Communications Systems Networking issues, web services, project management.
- SIE 531 Discrete Event Simulation Simulation Modeling including both a statistical treatment and a practical treatment using Arena.
- SIE 340 Deterministic Optimization A first linear optimization course.
- IEMS 201 Introductory Statistics At Northwestern University, from descriptive statistics to RSM.

**National/International outreach**

- Member of the Technical Leadership Council, Computational Infrastructure for Operations Research (COIN-OR, www.coin-or.org), 2004-Present

COIN-OR is an international organization that promotes Operations Research through Open Source Software. As a member of the TLC, my responsibilities include: creating project management policies, designing the underlying computational infrastructure to support the organization, and refereeing new submissions to the organization.

- Session or Cluster Chair in international Conferences

INFORMS National Meeting 2008 (Systems Biology Cluster co-Chair), 2007 (Systems Biology Cluster co-Chair), 2004, 2003, 2002;
PROFESSIONAL PREPARATION
The University of Melbourne Mechanical and Manufacturing Exchange program 1994 Engineering
POSTECH Industrial Engineering B.S. 1996
The Pennsylvania State University Industrial and Manufacturing Engineering M.S. 1998
The Pennsylvania State University Industrial and Manufacturing Engineering Ph.D. 2000

APPOINTMENTS
2006-Present: University of Arizona, Tucson, Arizona
Associate Professor, Systems and Industrial Engineering
2008-Present: Director, Program in Advanced Integration of Manufacturing Systems and Technologies (AIMST), University of Arizona, Tucson, Arizona
2000-2006: University of Arizona, Tucson, Arizona
Assistant Professor, Systems and Industrial Engineering
1999-2000: National Institute of Standards and Technology, Gaithersburg, Maryland
Guest Researcher, Manufacturing Systems Integration Division
1996-1996: Pohang University of Science and Technology, Pohang, Korea
System Analyst, Center for Industrial and Mfg. Eng. Research Resources

PUBLICATIONS (Out of 50 journal papers, 10 are listed in this CV)
SYNERGISTIC ACTIVITIES

1. **Awards and Honors:** IIE 2005 Outstanding Young Industrial Engineer Award; SME 2004 M. Eugene Merchant Outstanding Young Manufacturing Engineer Award; Best Paper Award at IIE Annual Meeting (Modeling and Simulation Track in 2005 and 2009; Homeland Security Track in 2008); Best Paper Award from International Journal of Industrial Engineering in 2007; Seungho Lee and Nurcin Koyuncu (Dr. Son's advisees) received best Ph.D. scientific poster award in the Ph.D. Colloquium of IERC 2008 and 2009, respectively; Ritesh Kanetkar and Monish Madan (Dr. Son's graduate advisees) took the first and third places in the ICIE 2003 Graduate Student Paper Contest; Supervisor for the IIE (Rockwell Software) National Student Simulation Contest (2nd Place in 2004, 1st Place in 2002, Finalist in 2001 and 2006); Graham Endowed Fellowship at the Penn State University in 1999; Council of Logistics Management Scholar in 1997 – 1998; Rotary International Multi-year Ambassadorial Scholar in 1996 – 1997; Graduation with honors (Dean's list for all semesters) at POSTECH in Korea in 1992 – 1995

2. **Other Major Project Activities:** PI for NSF-SOD Award (NSF-SOD-0725336; $799,985; August 2007–July 2010) on “SOFTSIM - a Testbed for Process-Driven and Simulation-Based Knowledge Conglomeration in Enterprise Software Development”; Co-PI for AFOSR MURI Award (F49620-03-1-0377; $3,987,238; June 2003–June 2008) on “Predicting and Prescribing Human Decision Making Under Uncertain and Complex Scenarios”

3. **Journal Editorial Activities:** Associate Editor of *International Journal of Modeling and Simulation*; Associate Editor of *International Journal of Simulation and Process Modeling*; Editorial Board Member of *International Journal of Services Operations and Informatics*


5. **Other Leadership Activities:** Director of Program in Advanced Integration of Manufacturing Systems and Technologies (AIMST) at UA in 2008–present; Graduate Chair of Systems and Industrial Engineering at UA in August 2007–present; Chapter Secretary of IIE Central Arizona Chapter in May 2005–May 2008; Vice President of Arizona chapter, Korean-American Scientists and Engineers Asso., 2003-May 2007; Secretary of Pennsylvania chapter, Korean-American Scientists and Engineers Asso., 1998-2000; Representative of IE Dept, Engineering Graduate Student Council, The Penn State University, 1997; President of Industrial Engineering Undergraduate Student Association, Pohang University of Science and Technology, KOREA 1994

COLLABORATORS AND OTHER AFFILIATIONS

1. **Collaborators:** Ron Askin at Arizona State; Judy Jin at U of Michigan; Cole Smith at Florida; Suvrajeet Sen at Ohio State; Ming Zhou at Indiana State; Al Jones at NIST; Simge Kucukyavuz at Ohio State; Yi-Chang Chiu at UA

2. **Graduate Advisor:** Richard A. Wysk, The Pennsylvania State University

3. **Graduate Students:** Current (N. Koyuncu (Ph.D.), E. Mazhari (Ph.D), J. Zhao (Ph.D.), H. Xi (Ph.D), S. Sai); Past (Jayendran Venkateswaran (Ph.D., IIT in India), Xiaobing Zhao (Ph.D, John Deere), Shravan Krishnan (Ph.D., US Coast Guard), Seungho Lee (Ph.D., Postdoc at UA), 16 M.S. students)
Curriculum Vitae – NSF

Ferenc Szidarovszky

312 Engineering Building, University of Arizona, Tucson 85721
(520) 621-6557 (Office)
(520) 621-6555 (Fax)
szidar@sie.arizona.edu

PROFESSIONAL PREPARATION

Ph.D. Karl Marx University of Economics, Budapest, May 1977,
Institute of Mathematics and Computer Science.

Ph.D. Eotvos University of Science, Budapest, May 1970,
Department of Numerical and Computer Mathematics.

M.S. Eotvos University of Science, Budapest, May 1968,
Department of Mathematical Analysis.

B.S. Eotvos University of Science, Budapest, May 1966
Department of Mathematical Analysis.

APPOINTMENTS

<table>
<thead>
<tr>
<th>Years</th>
<th>Location</th>
<th>Position</th>
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<tbody>
<tr>
<td>1990-present</td>
<td>The University of Arizona, Tucson, Arizona</td>
<td>Full Professor, Systems and Industrial Engineering</td>
</tr>
<tr>
<td>1988-1990</td>
<td>The University of Arizona, Tucson, Arizona</td>
<td>Visiting Professor, Systems and Industrial Engineering</td>
</tr>
<tr>
<td>1987-1988</td>
<td>The University of Texas of El Paso, Texas</td>
<td>Visiting Professor, Mathematical Sciences</td>
</tr>
<tr>
<td>1986-1990</td>
<td>Karl Marx University of Economics, Budapest,</td>
<td>Professor, Mathematics</td>
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<td></td>
<td>Hungary</td>
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<tr>
<td>1981-1983</td>
<td>The University of Arizona, Tucson, Arizona</td>
<td>Visiting Professor, Systems and Industrial Engineering</td>
</tr>
<tr>
<td>1977-1986</td>
<td>University of Horticulture and Food Industry,</td>
<td>Professor, Acting Head, Mathematics and Computer Science</td>
</tr>
<tr>
<td></td>
<td>Budapest, Hungary</td>
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<tr>
<td>1972-1977</td>
<td>Eotvos University of Science, Budapest, Hungary</td>
<td>Associate Professor, Numerical and Computer Mathematics</td>
</tr>
<tr>
<td>1970-1972</td>
<td>Eotvos University of Science, Budapest, Hungary</td>
<td>Senior Lecturer, Numerical and Computer Mathematics</td>
</tr>
<tr>
<td>1968-1970</td>
<td>Eotvos University of Science, Budapest, Hungary</td>
<td>Lecturer, Numerical and Computer Mathematics</td>
</tr>
</tbody>
</table>

HONORS AND AWARDS RELATED TO PROPOSAL

- Candidate of Mathematical Science, Hungarian Academy of Sciences, 1975
- Doctor of Engineering Science, Hungarian Academy of Sciences, 1986
- Dr. Habilit in Engineering, Budapest Technical University, 1998

PUBLICATIONS – RELATED TO THE PROPOSAL


PUBLICATIONS – OTHER

Collaborators: Cole Smith (Florida), Miklos Szilagyi (Arizona), Jijun Zhao (China), Koji Okuguchi (Japan), Carl Chiarella (Sydney), Akio Matsumoto (Tokyo), Michael Kopel (Vienna), Gian-Italo Bischi (Urbino), Emery Coppola (NOAH, New Jersey), Mary Poulton (Arizona) Andrew Engel (San Deigo), Ferenc Forgo (Budapest).

Advisors: Paul Turan, Otto Kis (Budapest, Eotvos University of Science)


Total number of graduate students advised: 58