



*Department of Electrical and
Computer Engineering*

2004 - 2005
Annual Report

July 1, 2004 - June 30, 2005

www.bu.edu/ece

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This report provides a detailed description of the instructional and research activities of the faculty, staff, and students of the Department of Electrical and Computer Engineering (ECE) at Boston University during the 2004-2005 academic year. Instructional activities are reported for Fall 2004, Spring 2005, and Summer 2005 semesters. Publications and scholarly activities, as well as budget information, are reported for the 2005 fiscal year (July 1, 2004 to June 30, 2005). Key data for this year are also compared to previous years to show progress and identify trends. More information on ECE's recent activities is reported at the department web site, <http://www.bu.edu/ece>.

1.1 Faculty

Three new full-time faculty joined the ECE Department this year. **Prakash Ishwar** was appointed Assistant Professor (tenure-track) beginning September 1, 2004. He received his Ph.D. from the University of Illinois at Urbana-Champaign in 2002. His research interests include distributed and collaborative signal processing, multi-terminal information theory, statistical modeling and inference, image and video coding and processing, multiresolution signal processing, and optimization with applications to sensor networks, multimedia-over-wireless, and security. (*See sidebar.*)

Wei Qin was appointed Assistant Professor (tenure-track) beginning September 1, 2004. He received his Ph.D. from Princeton University in 2004. His research interests include tools, methods and architectures for embedded systems, synthesis and verification of programmable processors, and design languages for electronic systems. (*See sidebar.*)

Joshua Semeter was appointed Assistant Professor (tenure-track) beginning September 1, 2004. He received his Ph.D. from Boston University in 1997. His research interests include ionospheric and space plasma physics, spectroscopy of atmospheric airglow and the aurora borealis, image processing, and radar systems and radar signal processing. (*See sidebar.*)

Recruitment of new faculty has continued. **Luca Dal Negro** will be joining the faculty as Assistant Professor (tenure-track) in January of 2006. Dal Negro received his Ph.D. from the University of Trento, Italy in 2003, and is a post-doctoral fellow at M.I.T. His research interests include nanotechnology, the optical physics of semiconductor nanostructures and photonic-crystal structures, advanced material solutions for light emission, and light control in silicon-based systems.

Two faculty members were promoted to the rank of Full Professor: **Michael F. Ruane** and **Thomas D.C. Little**. Professor Little returned to full-time teaching and research in the Spring of 2005. **Venkatesh Saligrama** has been promoted to the rank of Associate Professor (tenure-track), effective September 1, 2005. **Anna Swan** was promoted from Research Assistant Professor to Research Associate Professor, effective January 1, 2005.

one: Highlights



Prakash Ishwar received his Ph.D. in Electrical and Computer Engineering in 2002 from the University of Illinois at Urbana-Champaign. He spent two years as an associate specialist at the University of California at Berkeley in the Electronics Research Laboratory, where he worked alongside Prof. K. Ramchandran. Their research focused on distributed/collaborative signal processing and multiterminal information theory with application to sensor networks, multimedia-over-wireless, and security. On September 1st, 2004, he joined the faculty of Boston University at the rank of Assistant Professor.

His research interests include image and video coding and processing, multiresolution signal processing, optimization with applications to sensor networks, multimedia-over-wireless, and security.



Wei Qin received his Ph.D. in Electrical Engineering in 2004 from Princeton University. Prior to receiving his Ph.D., he spent five years as a graduate research assistant for the Electrical Engineering department at Princeton University. In September 2004, he joined the faculty of Boston University as an Assistant Professor of the Electrical and Computer Engineering Department.

His research interests include design tools and methods for embedded systems and embedded processors, and design language for electronics systems.



Joshua Semeter received his Ph.D. in Electrical Engineering in 1997 from Boston University. He spent two years as a staff scientist at Max-Planck-Institut für extraterrestrische Physik, Garching, Germany, and five years as a senior research engineer for SRI International. In September 2004, he joined the faculty of Boston University as an Assistant Professor of Electrical and Computer Engineering.

His research interests include ionospheric and space plasma physics, spectroscopy of the atmospheric airglow and the aurora borealis, image reconstruction and tomography, multispectral imaging, sensory development and signal analysis, and physics based fusion of radio and optical diagnostics.

Sabbatical leaves this year included Professor **Alexander Sergienko** in the Fall of 2004, and Professor **Robert Kotiuga** in the Spring of 2005.

Faculty Awards and Honors

Enrico Bellotti received an NSF CAREER award in support of his research on “Theoretical Investigation of Single Photon Detectors for Quantum Technology: A Nano-structure Devices Approach.”

Maja Bystrom received the 2005 ECE Award for Excellence in Teaching, based on nominations from College students, faculty, and staff, as well as evaluation of teaching statements, classroom material and evaluations.

Roscoe Giles was named by the Career Communications Group (CCG) as one of the “50 Most Important Blacks in Research Science in 2004.”

Hamid Nawab was awarded the 2005 College of Engineering Service Award for outstanding contributions to the College through involvement in programs, committees, and organizations within the College and University.

Alan Pisano received the GE Career Achievement Award, which honors individuals who have established a true legacy of contributions, based on recognized expertise, mentoring, and overall peer respect.

Michael Ruane was selected as the recipient of the ASEE New England Section Outstanding Teacher Award.

Bahaa Saleh received the International Society for Optical Engineering (SPIE) 2004 BACUS Prize for his contributions to photomask technology, including establishing the foundation on which modern optical proximity correction is based. The award is presented annually to an individual or individuals who have, through invention or other activity, made a significant impact on the technology of photomask making.

Venkatesh Saligrama received an NSF CAREER award in support of his research on “A Systems Approach to Networked Decision Making in Uncertain Environments”.

David Starobinski received a Department of Energy (DOE) Early Career Award.

Selim Ünlü was selected by the IEEE Lasers & Electro-Optics Society (LEOS) as one of the LEOS Distinguished Lecturers for 2005-06.

1.2 Undergraduate Program

This was the first academic year after the successful ABET visit we had in AY 2003/2004. Despite the fact that the next accreditation visit is several years away, we did not lose our momentum in implementing the continual improvement cycles for our EE and CSE programs. For example, a new undergraduate course, Probability for Electrical & Computer Engineers, was proposed by the ECE undergraduate committee and approved by the ECE faculty with the view of achieving better learning outcomes in the probability area. In another instance, the ECE faculty discussed and approved a proposal for using a common application (such as a cellular phone) as a running theme in various core courses as a means of helping the students see connections between those courses. The objective here is to obtain better learning outcomes along the “integrated view” dimension.

Enrollment in the BS programs has been steady in recent years. A total of 310 students enrolled in the Electrical Engineering (EE) and Computer Systems Engineering (CSE) programs, with CSE enrollment now making up roughly 46% of the total undergraduate enrollment. The number of EE and CSE BS degrees awarded this year were 56 and 48, respectively. (*See details in Section 3.1 and enrollment history in Section 6.2.*)

Efforts to enhance the undergraduate laboratories are successfully ongoing, with new equipment, maintenance, and upgrades this year at a total cost of \$192k. In both classrooms and laboratories, emphasis is placed on design, laboratory practice, and applications. Successful ideas that were initiated in previous years, such as the Teaching Workshop, the ECE Senior Project Day, ECE Advising Day, and the ECE Teaching Excellence Award, continued this year. (*See Section 3 for more information.*)

Undergraduate Student Awards

A team of Electrical Engineering students (**Ido Hochman, Mike Mole, Ken Lopez, and Patrick Ward**) won first prize at the Institute of Electrical and Electronics Engineers (IEEE) fifth annual Student Design Contest in early May, 2005 for creating an inexpensive and convenient system for locating empty parking spaces in a parking lot. Dubbed iPark, the wireless computerized system would use commercially available digital cameras to locate empty spots and communicate the information to drivers or a parking attendant. The students were advised by Professor W. Clem Karl and Associate Professor Janusz Konrad of the Electrical and Computer Engineering Department.

Students **Michael Chalson, Michael Datta, Arpan Savla, and Andrew Schwartz** were selected by Senior Project faculty as recipients of the 2005 ECE Outstanding Senior Project Award.

1.3 Graduate Program

New student recruiting efforts were successful in 2004-2005. Five Dean's Research Fellows began matriculation in ECE: four PhD students and one MS student. All four PhD students will be continuing their degree programs and all are making excellent progress in their programs. We have recruited 5 new DRF's for the Fall 2005 semester.

After a review of the admissions process, it has become much more selective in respect to PhD students. We now require a clear path to continued financial aid for the applicants. We have also refined the guidelines and procedures for admissions, resulting in the first round of financial aid offers to be made several weeks earlier compared to previous years.

We continue to use the PhD student database to provide simple and rapid access to PhD student records for the ECE faculty and administration. In addition, the College of Engineering and ECE have been working on improving forms, including RA contracts, and scanning them into electronic format for easy access.

Graduate Student Awards

Graduate students have once again had an excellent showing in the Science and Technology Day. **Rosalind Wynne** received the "College Of Engineering Award Dean's Award" for her poster "Microstructured optical fiber fabrication: An integrated parametric approach" (Advisor: Theodore Morse). The "CenSSIS Award" was received by **Yonggang Shi** for his poster, "Fast level sets without solving PDEs" (Advisor: W. Clem Karl). The "Photonics Berman Future of Light Award" was received by **Ayca Yalcin** for her poster "Optical sensing of biomolecules using microring resonators. (Advisor: Selim Ünlü). In addition, a new "Electrical and Computer Engineering Award" was introduced this year. In its inaugural year, it was shared by two students. **Steven Menn** received it for his poster "Silicon Photodiodes for Wireless Opto-electrical Stimulation of Neural



Rosalind Wynne receiving the College of Engineering Dean's Award from Mark Hornstein, Associate Dean for Graduate Programs.

Tissue" (Advisor: Selim Ünlü). **Justin Quesnel** received it for his poster "Pulsed acousto-optic imaging (AOI) and its fusion with conventional diagnostic ultrasound" (Co-advisors: Allyn Hubbard and Selim Ünlü).

Graduate students **I. Emre Ozkumur** and **Marcos A. Diaz Quezada** received the 2004/2005 ECE Graduate Teaching Fellow of the Year Award.

1.4 Research

New research funding this year totaled approximately \$9.9M, of which \$6.4M were grants for which the Principal Investigators (PI) were ECE faculty, and \$3.5M were shares in grants for which ECE faculty were co-PI's and the PI's were from other departments. Similar figures for the 2003-2004 fiscal year were \$6.9M (\$6.0M + \$0.9M). (See Section 5.5 for details on research funding.)

Several large research grants received this year were in support of inter-departmental collaborative research. A new grant was received from NSF for research entitled "EPIC - Engaging People in Cyberinfrastructure" (\$1.5M), with Roscoe Giles as PI, through the Center for Computational Science. Another new grant was received from NSF entitled "MRI - Acquisition of Blue Gene/L Supercomputer for Computational Science Research (\$800k), with Claudio Rebbi (PI) and Roscoe Giles as one of three co-PI's (in conjunction with the Center for Computational Science). Murat Alanyali (PI), with Clem Karl and Venkatesh Saligrama as co-PI's, received a new NSF grant in the amount of \$373k for "Distributed Materials for Statistical Decision-Making in Networked Environments," in conjunction with the Center for Information and Systems Engineering. David Mountain (PI) and Allyn Hubbard (one of several co-PI's) of the Hearing Research Center continued research on six DOD grants, with renewed funding totaling \$1.8M.

New ECE grants included a DOD grant for Enrico Bellotti (PI) at \$150k, and David Castañón (PI) had a new DOD/Air Force grant (\$155k). New from NSF was a CAREER award for Enrico Bellotti for "Theoretical Investigation of Single Photon Detectors for Quantum Technology: A Nano-structure Devices Approach", funded at \$400k, as well as a CAREER award for Venkatesh Saligrama for "A Systems Approach to Networked Decision Making in Uncertain Environments", at \$80k. Additionally, Theodore Morse received a DOD/Air Force grant for "Special Fibers for Clinical Applications" and Theodore Moustakas received a new DOD/Army grant funded at \$110k.

Research under the NSF Center for Subsurface Sensing and Imaging Systems (CenSSIS) program continues this year with Research Thrust 1 (Bahaa Saleh) funded at \$126k; Research

Thrust 2 (David Castañón) receiving funding of \$294k, and the Education Program (Michael Ruane) receiving \$60k in funding. Bahaa Saleh as PI and Malvin Teich and Alexander Sergienko as co-PI's were awarded a DARPA grant, "Quantum Imaging: New Methods and Applications (MURI) (subcontracted with the University of Rochester) in the amount of \$143k and Alexander Sergienko (PI), with Bahaa Saleh and Mal Teich as co-PI's, received continued funding (\$296k) from DARPA for the "Ultrafast Quantum Optics (Amendments 7 and 8) (subcontract via BBN Solutions, LLC).

This year, the ECE faculty, academic staff, and graduate students have published 57 research papers in archival journals, authored, co-authored or edited 10 books or book chapters, and made 104 conference contributions (papers, abstracts, and presentations). They have also filed 7 patents or patent disclosures. (See Section 5.4 for a complete listing of faculty publications.) The Department continued its weekly Research Spotlight Seminar series this year. Five ECE faculty presented highlights of their research.

1.5 Special Events

ECE Day 2005

Initiated in 1997, the ECE Day is a forum for presentation of the students' senior design projects. Held at the end of the Spring semester, ECE Day 2005 included 88 presentations on different projects conducted by groups of 3 to 4 students. The presentations were attended by students, faculty, alumni, company representatives, and members of the ECE Industrial Advisory Council. (For more information on ECE Day 2005 see Section 3.4.)

ECE Retreat

The ECE Department held its annual Faculty Retreat on May 18, 2005 at the Boston University Corporate Education Center in Tyngsboro, MA. This year's principal theme was curricular issues. New initiatives for the undergraduate curriculum included creation of a curriculum with an application focus and a new integrating theme, new freshman modules, and a new lab structure. Discussion of the graduate curriculum included MS project requirements, graduate core course requirements, update of degree concentrations, graduate lab courses, and recent experience with graduate student recruiting. Initiatives for large research, education, or outreach grant proposals were also discussed.

Industrial Advisory Council

The IAC held its annual meeting on May 5, 2005. The Council discussed the state of the ECE undergraduate laboratories. Other discussions included the recruitment and retention of undergraduate students, creation of an integrated ECE curriculum with an application focus, improving the freshman experience, and the teaching of biology in the ECE curriculum. Members of the IAC attended selected Senior Design student presentations and participated in the Senior Design awards ceremony.

Industrial Advisory Council Members

Hassan Ahmed
President
Sonus Networks, Inc.



Tom Arseneault
Vice President Engineering
Information and Electronic Warfare Systems
Paul Hoffman
Director of Engineering Operations
BAE Systems



Jihad Boura
Senior Member, Technical Staff
Altera



William Bowhers
Engineering Manager
Teradyne



Julie M. Cubino
Manager, ASIC Design Kit
IBM Microelectronics



D. George Gata
Texas Instruments
Mixed Signal Custom Products Department
Advanced Analog Core Design



Katie Hall
Founding Partner
Wide Net Technologies

Anuj Jain
Technical Staff
IBM



Micah Knapp
Staff Engineer
SGI



Christina Knopp
Marketing Manager
DUSA Pharmaceuticals Inc.



Kevin Knopp
Director of Engineering
Ahura Corporation



David Kukulinsky
President
SIR, Inc.

Ben H. Mbugua
Front Line Application Manager
Analog Devices, Inc., DSP Division



Rich Molnar
Technical Staff
MIT Lincoln Laboratory



Anthony Palmieri
Marketing Applications Manager
Applied Micro Circuits Corporation



John Reinke
Sr. Director, eBusiness Solutions Group
Siebel Systems, Inc.



Gary Smith
Principal Engineer
Corning Lasertron, Inc.



two: *Faculty & Staff*



2.1 Faculty



Murat Alanyali, Assistant Professor

- Ph.D., University of Illinois, Urbana-Champaign 1996
- Communication networks; performance analysis and optimization; stochastic systems
- 2003 NSF CAREER Award
- 2004 Legacy Gift Award, College of Engineering
- Associate Editor, *IEEE Control Systems Society Conference Editorial Board*



Enrico Bellotti, Assistant Professor

- Ph.D., Georgia Institute of Technology, 1999
- Computational electronics; semiconductor materials and device simulations; power electronics; parallel computing
- 2005 NSF CAREER Award
- 2003 ONR Young Investigator Award



Irving Bigio, Professor

- Ph.D., University of Michigan, 1974
- Medical application of optics, lasers, and spectroscopy; biophotonics; nonlinear optics; applied spectroscopy; laser physics
- Fellow - Optical Society of America, American Society for Lasers In Medicine and Surgery, American Institute for Medical & Biological Engineering
- Los Alamos Inventor Awards, 1994, 1996, 1999



Richard Brower, Professor

- Ph.D., University of California, 1969
- Molecular dynamics simulation for biomolecules; lattices methods for QCD and statistical mechanics; quantum field theory of strings and particles
- A.P. Sloan Research Fellow, SLAC and M.I.T., 1974-1976
- Past Managing Editor, *International Journal of Computational Physics C*



Maja Bystrom, Associate Professor

- Ph.D., Rensselaer Polytechnic Institute, 1997
- Source and channel coding; multi-media communications; image processing
- 1999 NSF CAREER Award
- 2005 ECE Award for Excellence in Teaching
- 2001 Fulbright Award
- Associate Editor, *Signal Processing Letters*



David Campbell, Professor & Dean

- Ph.D., Cambridge University, 1970
- General nonlinear phenomena and complex systems; novel electronic materials, including conducting polymers and organic and high t_c superconductors; electron transport in semiconductor superlattices
- Fellow - American Physical Society, American Association for the Advancement of Science
- Editor-in-Chief, *Chaos*; Editor, *Physics Reports*



Jeffrey Carruthers, Associate Professor

- Ph.D., University of California, Berkeley, 1997
- Wireless infrared communications; broadband communications; mobile and wireless networks
- 1999 NSF CAREER Award
- Senior Member, IEEE
- 2001 ECE Award for Excellence in Teaching



David Castañon, Professor

- Ph.D., Massachusetts Institute of Technology, 1976
- Stochastic control; estimation optimization; image understanding and parallel computation
- Associate Director, Center for Subsurface Sensing and Imaging Systems; Co-Director, BU Center for Information and Systems Engineering (CenSSIS)
- Associate Editor, *Computational Optimization and Applications*; Past Associate Editor, *IEEE Transactions on Automatic Control*



Azza Fahim, Assistant Professor

- Ph.D., Cairo University, 1984
- Electric machines; computations in electromagnetics



Roscoe Giles, Professor

- Ph.D., Stanford University, 1975
- Advanced computer architectures; distributed and parallel computing; computational science
- Cited as one of the "50 Most Important Blacks in Research Science in 2004" by The Career Communications Group (CCG)
- A. Nico Haberman Award, CRA
- 1996 College of Engineering Award for Excellence in Teaching



Martin Herbordt, Associate Professor

- Ph.D., University of Massachusetts, 1994
- Computer architecture; electronic design automation; communication switch design; computer vision architecture; bioinformatics
- 1997 NSF CAREER Award
- 2004 Legacy Award, College of Engineering



Mark Horenstein, Professor & Associate Dean for Graduate Studies

- Ph.D., Massachusetts Institute of Technology, 1978
- Applied electromagnetics; electrostatics; microelectromechanical systems
- President, Electrostatics Society of America
- Editor-in-Chief, *Journal of Electrostatics*



Allyn Hubbard, Professor

- Ph.D., University of Wisconsin-Madison, 1977
- VLSI design using analog and digital techniques in CMOS; neural net chips, smart sensor chips, and chips with biological applications; models of the peripheral auditory system
- 2002 College of Engineering Award for Excellence in Teaching



Prakash Ishwar, Assistant Professor

- Ph.D., University of Illinois Urbana-Champaign, 2002
- Distributed and collaborative signal processing; multi-terminal information theory; statistical modeling and inference; image and video coding and processing; multiresolution signal processing and optimization with applications to sensor networks; multimedia-over-wireless security



W. Clem Karl, Professor

- Ph.D., Massachusetts Institute of Technology, 1991
- Multidimensional and multiscale signal and image processing and estimation, particularly applied to geometrically and medically oriented problems
- 2000 ECE Award for Excellence in Teaching
- Past Associate Editor, *Tomography & MRI, IEEE Transactions on Image Processing*; Past Assistant Editor, *Systems Control Newsletter*



Mark Karpovsky, Professor

- Ph.D., Leningrad Electrotechnical Institute, 1967
- Design of secure cryptographic devices and smart cards; routing in interconnection networks; design and protection of cryptographic devices; fault-tolerant computing; error correcting codes; testing and diagnosis of computer hardware
- Fellow and Senior Member, IEEE
- Past Associate Editor, *Tomography and MRI, IEEE Transactions on Image Processing*



Thomas Kincaid, Professor

- Ph.D., Massachusetts Institute of Technology, 1965
- Signal and image processing; neurodynamics; non-destructive testing



Ronald Knepper, Professor

- Ph.D., Carnegie Mellon University, 1969
- VLSI integrated circuit technology; SiGe BICMOS device and circuit modeling; silicon CMOS & bipolar devices; numerical device simulation; RF/analog IC design
- Fellow, IEEE
- 1989 IBM Outstanding Innovation Award; 1988 IBM Division Award; 1983 IBM Outstanding Technical Achievement Award
- Past Editor, *Solid State Electronics*



Janusz Konrad, Associate Professor

- Ph.D., McGill University, 1989
- Multimedia communications; image and video processing; stereoscopic and 3-D imaging; digital signal processing
- Senior Member, IEEE
- 2001 IEEE Signal Processing Magazine Award
- Associate Technical Editor, *IEEE Communications Magazine*; Past Associate Editor, *IEEE Signal Processing Letters*; Past Associate Editor, *IEEE Transactions on Image Processing*



Robert Kotiuga, Associate Professor

- Ph.D., McGill University, 1985
- Electromagnetics; numerical methods for three-dimensional vector field problems; Whitney forms and the Finite Element Method; micromagnetics; nanoscale magnetics; geometric inverse problems; Topological aspects of magnetic scalar potentials; helicity functionals; analysis of high performance interconnects
- Member, Electromagnetics Academy



Min-Chang Lee, Professor

- Ph.D., University of California, San Diego, 1977
- Radio communications; experimental plasma physics; ionospheric plasma physics
- Past Associate Editor, *AGUs Radio Science*



Lev Levitin, Distinguished Professor

- Ph.D., USSR Academy of Sciences, Gorky University, 1969
- Information theory; physics of communication and computing; complex and organized systems; quantum theory of measurement; reliable communication and computing
- Fellow, IEEE
- Member, International Academy of Informatization



Thomas Little, Professor

- Ph.D., Syracuse University, 1991
- Mobile Ad Hoc Networks (MANETs); multimedia computing; computer networking; software engineering; embedded sensor networks
- 1995 NSF CAREER Award
- Editorial Board Member, *ACM/Springer Multimedia Systems, Journal of Multimedia Tools and Applications*



Theodore Morse, Professor

- Ph.D., Northwestern University, 1961
- Photonic material processing; optical fiber fabrication, lasers, and sensors
- Fulbright Fellow, Germany



Theodore Moustakas, Professor

- Ph.D., Columbia University, 1974
- Growth by MBE, MOCVD, HVPE and Gas-Cluster Ion Beam Deposition (GCIB); growth, fabrication and characterization of optical devices (UV-LEDs, UV-LDs, optical modulators, detectors), electronic devices (high power diodes, transistors and thyristors) and electromechanical devices (SiC/III-Nitride MEMS sensors); III-Nitride semiconductors (materials growth and device fabrication)
- Fellow, American Physical Society, Electrochemical Society
- 1998 ECE Award for Excellence in Teaching



S. Hamid Nawab, Professor & Associate Chair for Undergraduate Studies

- Ph.D., Massachusetts Institute of Technology, 1982
- Information and data extraction; algorithms/architectures with application to the analysis of brain to muscle communications via EMG signals from surface and needle electrodes
- 2005 College of Engineering Service Award
- 1998 College of Engineering Award for Excellence in Teaching
- 1993 Metcalf Award for Excellence in Teaching



William Oliver, Associate Professor

- Ph.D., University of Illinois, 1973
- Radar studies of the upper atmosphere and ionosphere; modeling and simulation; global change in the upper atmosphere
- Associate Director, BU Center for Space Physics



Roberto Paiella, Assistant Professor

- Ph.D., California Institute of Technology, 1998
- Optical technologies for information processing; photonic devices based on semiconductor quantum structures, including group-III nitride quantum wells; nanoscale photonic devices and circuits; ultrafast optics
- Vice Chair, IEEE Laser and Electro-Optics Society (LEOS), New England Chapter



Wei Qin, Assistant Professor

- Ph.D., Princeton University, 2004
- Tools, methods and architectures for embedded system; synthesis and verification of programmable processors; design languages for electronic systems



Tatyana Roziner, Associate Professor

- Ph.D., Moscow Scientific Research Institute, 1975
- Digital design; testing and diagnostics of computer hardware; fault-tolerant computing



Michael Ruane, Professor

- Ph.D., Massachusetts Institute of Technology, 1980
- Resonant cavity imaging system; micro-magnetics modeling; optical systems; AFRL Loss Cone Imager DSX Satellite
- Senior Member, IEEE
- 2004 ASEE New England Section Outstanding Teacher Award
- 1999 ECE Award for Excellence in Teaching
- 1991 College of Engineering Faculty Service Award



Alexander Sergienko, Professor

- Ph.D., Moscow State University, 1987
- Correlation spectroscopy, field optical microscopy and spectroscopy of semiconductor materials and devices; quantum communications; remote laser sensing; laser physics; nonlinear optics; quantum optics, including quantum radiometry and metrology
- 1999 NSF CAREER Award
- Fellow, Optical Society of America
- 2001 ECE Award for Excellence in Teaching



Bahaa E.A. Saleh, Professor & Chairman

- Ph.D., Johns Hopkins University, 1971
- Quantum optics; nonlinear optics; image processing
- Fellow, IEEE, Optical Society of America, John Simon Guggenheim Foundation
- 2004 BACUS Award
- 1999 OSA Beller Award
- Deputy Director, Center for Subsurface Imaging and Imaging Systems (CenSSIS)
- Past Editor-in-Chief, *Journal of the Optical Society of America A: Optics, Image Science and Vision*



Thomas Skinner, Associate Professor

- Ph.D., Boston University, 1982
- Microprocessors; computer networks; operating systems; distributed systems
- 2003 Microsoft Most Valuable Professional Award
- 1997 College of Engineering Award for Excellence in Teaching



David Starobinski, Assistant Professor

- Ph.D., Technion, Israel Institute of Technology, 1999
- Wireless and sensor networks; QOS and traffic engineering; networks performance evaluation
- 2004 Department of Energy Early Career Award
- 2002 NSF CAREER Award



Venkatesh Saligrama, Assistant Professor

- Ph.D., Massachusetts Institute of Technology, 1997
- Information and control theory; statistical signal processing; applications to sensor networks
- 2005 NSF CAREER Award
- 2003 ONR Presidential Early Career Award
- 2002 ONR Young Investigator Award



Alexander Taubin, Associate Professor

- Ph.D., Electrotechnical University of St. Petersburg, 1981
- Asynchronous circuit, logic design; computer architecture; CAD; attack resistant hardware
- Senior Member, IEEE



Joshua Semeter, Assistant Professor

- Ph.D., Boston University, 1997
- Ionospheric and space plasma physics; spectroscopy of atmospheric airglow and the aurora borealis; image processing; radar systems and radar signal processing
- 2004 SRI Presidential Achievement Award
- 2000 Prize Lecture, NSF Cedar Workshop
- Associate Editor, *Journal of Geophysical Research*



Malvin Teich, Professor

- Ph.D., Cornell University, 1966
- Quantum optics and imaging; photonics; fractal stochastic processes; information transmission in biological sensory systems
- Fellow, IEEE, American Physical Society, Acoustical Society of America, American Association for the Advancement of Science, John Simon Guggenheim Foundation, Optical Society of America
- 1997 IEEE Morris E. Leeds Award, 1992 Palacky University Memorial Gold Medal, 1969 IEEE Browder J. Thompson Memorial Prize
- Editorial Advisor, Photonics and Physical Electronics, *Physics Today*



Tommaso Toffoli, *Associate Professor*

- Ph.D., University of Michigan, 1977
- Fundamental connections between physics and computation; fine-grained modeling of physics-like systems technology (cellular automata machines) and methodology (programmable matter); personal knowledge structuring
- Senior Member, IEEE
- Member, Editorial Board *Complex Systems*; *The Interjournal* (on-line)



Ari Trachtenberg, *Assistant Professor*

- Ph.D., University of Illinois, Urbana-Champaign, 2000
- Error correcting codes; data synchronization (especially for PDAs and mobile networks); sensor-based location detection; algorithms
- 2002 NSF CAREER Award
- 2003 ECE Award for Excellence in Teaching



Selim Ünlü, *Professor & Associate Chair for Graduate Studies*

- Ph.D., University of Illinois, Urbana-Champaign, 1992
- Near-field optical microscopy and spectroscopy of semiconductor materials and devices; design, processing, characterization and simulation of semiconductor optoelectronic devices; nanoscale imaging of biological samples, biosensors
- 2005 IEEE Lasers and Electro-Optics Society (LEOS) Distinguished Lecturer
- 1996 NSF CAREER Award
- 1996 ONR Young Investigator Award
- 2002 ECE Award for Excellence in Teaching
- Senior Member, IEEE
- Associate Editor, *IEEE Journal of Quantum Electronics*

Research Faculty



Floyd Humphrey, *Research Professor*

- Ph.D., California Institute of Technology, 1956
- Computer simulations of magnetic materials and storage devices; magnetic sensors
- Life Fellow, IEEE
- IEEE - 100th Anniversary Gold Medal for Service
- 1998 Magnetics Society Achievement Award
- Millenium Medal



Fei Luo, *Research Associate Professor*

- Ph.D., Chongqing University, 1991
- Distributed fiber optic sensors and systems; optical fiber grating sensors; interferometric sensors



Anna Swan, *Research Associate Professor*

- Ph.D., Boston University, 1993
- Development of nanoscale optical self-interference microscopy; optical properties of carbon nanotubes

Affiliated Faculty



John Baillieul, *Professor, Chairman, Dept. of Aerospace and Mechanical Engineering*

- Ph.D., Harvard University, 1975
- Robotics; control of mechanical systems; mathematical system theory
- IEEE Fellow
- Elected 40th President of IEEE
- Distinguished Member, IEEE Control Systems Society
- Director, Boston University Center for Control and Dynamics of Smart Structures
- Past Editor-in-Chief, *IEEE Transactions on Automatic Control*



Christos Cassandras, *Professor*

- Ph.D., Harvard University, 1982
- Analysis and control of discrete event dynamic systems; stochastic control and optimization; dynamic control of computer and communication networks
- IEEE Fellow, 1991 Lilly Fellow
- IEEE Control Systems Society Board of Governors
- Editor-in-Chief, *IEEE Transactions on Automatic Control*



- Supriya Chakrabarti, Professor**
- Ph.D., University of California, Berkeley, 1982
 - Space experimentation; ultraviolet spectroscopy
 - Director, Center for Space Physics



- Michael Mendillo, Professor**
(primary appointment with the Dept. of Astronomy and the Center for Space Physics)
- Ph.D., Boston University, 1971
 - Low-light level optical instrumentation; signal processing in space physics; planetary atmospheres; GPS satellite communications; space plasmas in the solar system
 - Fellow, American Geophysical Union



- Solomon Eisenberg, Associate Professor & Dean for Undergraduate Programs**
- Sc.D., Massachusetts Institute of Technology, 1983
 - Electrically mediated phenomena in tissues and biopolymers
 - 1987 NSF Presidential Young Investigator
 - 1990 Metcalf Award for Excellence in Teaching



- Peter O'Connor, Research Assistant Professor**
- Ph.D., Cornell University, 1995
 - Mass spectrometry instrumentation and applications
 - Assistant Director, Mass Spectrometry Resource, Boston University School of Medicine



- Leopold Felsen, Professor**
- D.E.E., Polytechnic Institute of Brooklyn, 1952
 - Wave propagation and diffraction in various disciplines; high-frequency and time domain asymptotics; wave-oriented data-processing and imaging
 - Fellow, IEEE, Optical Society of America, Acoustical Society of America, John Simon Guggenheim Foundation
 - IEEE Medals: 1991 Heinrich Hertz Gold Medal; 1984 Centennial; 2000 3rd Millennium
 - 1980 Senior Scientist Award, Humboldt Foundation
 - 1975 URSI Balthasar Van der Pol Gold Medal



- Eric Schwartz, Professor**
- Ph.D., Columbia University, 1973
 - Computational neural science; machine vision; neural anatomy; neural modeling



- William Skocpol, Professor**
(primary appointment with the Dept. of Physics)
- Ph.D., Harvard University, 1974
 - Nanofabrication; device processing; transport experiments in materials



- Theodore Fritz, Professor**
- Ph.D., University of Iowa, 1967
 - Space plasma and magnetospheric physics; magneto sphere-ionosphere coupling; substorms; charged particles and compositions; rocket and satellite experiments



- Bennett Goldberg, Professor**
(primary appointment with the Dept. of Physics)
- Ph.D., Brown University, 1987
 - Room- and low-temperature, near-field microscopy of semiconductors and biological systems; magneto-optics and magneto-transport of two- and one-dimensional electron fields
 - Alfred P. Sloan Fellow
 - NSF Presidential Young Investigator

Emeritus Faculty**John Brackett, Professor Emeritus**

- Ph.D., Purdue University, 1963
- Software engineering; software requirements definition; object-oriented testing; rapid prototyping of embedded systems

**David Perreault, Professor Emeritus**

- Ph.D., Purdue University, 1968
- Nonlinear networks; computer-aided design; microprocessors; distributed digital networks

**Richard Vidale, Professor Emeritus**

- Ph.D., University of Wisconsin-Madison, 1964
- Modeling and simulation, software engineering

**Moe Wasserman, Professor Emeritus**

- Ph.D., University of Michigan, 1955
- Semiconductor processing, electronic circuits

NSF PYI/CAREER Awards

Murat Alanyali	Thomas Little
Enrico Bellotti	Venkatesh Saligrama
Maja Bystrom	Alexander Sergienko
Jeffrey Carruthers	David Starobinski
Solomon Eisenberg	Ari Trachtenberg
Bennett Goldberg	Selim Ünlü
Martin Herbordt	

ONR Young Investigators

Enrico Bellotti
Venkatesh Saligrama
Selim Ünlü

PECASE Award

Venkatesh Saligrama

Visiting Faculty**Wolfgang Bacsa, Visiting Research Professor**

- Ph.D., Swiss Federal Institute of Technology, Zurich, 1990
- Professor, University Paul Sabatier, Toulouse, France
- Research in inelastic light scattering in low dimensions and strongly correlated electron systems, and in the synthesis of carbon nanotubes and their electronic and magnetic properties.

**Silvia Carrasco, Visiting Research Assistant Professor**

- Ph.D., Polytechnic University of Catalonia, Barcelona, Spain, 2003
- Nonlinear optics; solitons; quasi-phase-matching engineering; quantum optics and imaging

Fellows of Technical Societies**IEEE**

John Bailleul	Ronald Knepper
Christos Cassandras	Lev Levitin
Leopold Felsen	Bahaa Saleh
Floyd Humphrey	Malvin Teich
Mark Karpovsky	

American Physical Society (APS)

David Campbell
Theodore Moustakas
Malvin Teich

Optical Society of America

Irving Bigio
Leopold Felsen
Bahaa Saleh
Alexander Sergienko
Malvin Teich

Electrochemical Society (ECS)

Theodore Moustakas

2.2 Adjunct Faculty

The ECE Department looks outside the department and university for individuals to teach a few specific courses, as the need arises. These individuals bring a vast amount of engineering expertise, in both academic and industrial capacities, to the classroom. To the right is a list of people who have helped the Department meet its teaching needs over the past year.

John Brackett, SC518 (Spring 2005)

- PhD, Purdue University, 1963

Alan Pisano, SC463 (Fall 2004) & SC402 (Spring 2005)

- PhD, Northeastern University, 1974

Vladimir Kleptsyn, SC578 (Fall 2004)

- PhD, Moscow Lomonosov's Institute of Fine Chemical Technology, 1983

Leah Ziph-Schatzberg, SC500 (Fall 2004)

- M.S., Electrical Engineering, Technion Israel Institute of Technology, 1980

2.3 Research Staff

Name	Title	Advisor
Basilio Sanchez, Gilberto	Visiting Scholar	Theodore Morse
Belkacemi, Samir*	Visiting Scholar	Martin Herbordt
Bhattacharyya, Anirban	Research Associate	Theodore Moustakas
Bertazzi, Francesco*	Research Assistant	Enrico Bellotti
Blixt, Maarten	Senior Research Associate	Joshua Semeter
Friel, Ian	Research Associate	Theodore Moustakas
Guillet de Chatellus, Hugues	Research Associate	Alexander Sergienko
Ippolito, Stephen	Research Associate	Selim Ünlü
Jaeger, Gregg	Senior Research Associate	Alexander Sergienko
Jaspan, Martin	Senior Research Associate	Alexander Sergienko
Li, Xiaojun	Research Assistant	Theodore Morse
Redjdal, Makhlof	Research Associate	Floyd Humphrey
Shubochkin, Roman	Research Associate	Theodore Morse
Thomidis, Christos*	Research Assistant	Theodore Moustakas
Tsai, Shan-Wen	Research Associate	David Campbell
Wong, Wai Yan	Research Assistant	Malvin Teich

* Completed appointment during 2004/2005

2.4 Administrative and Technical Staff

Administrative Staff

Marchione, Carly Academic Programs Administrator
Enos, Scott*/open Grants Administrator
Gilber, Jim*/open Senior Administrative Secretary
Nabiel, Hemayat Financial Manager
Pastore, Michael*/open Administrative Assistant
Rennie, Wayne Department Director

* Resigned during 2004/2005

Technical Staff

Albro, Jeffrey Systems Analyst/Administrator I
Caine, Aaron Systems Analyst/Administrator III
Levin, Yefim*/open Systems Analyst/Administrator I
Fedyunin, Yuri MBE Laboratory Manager
Kleptsyn, Vladimir Electronics/Circuits Laboratory Manager
Open Laboratory Researcher

* Resigned during 2004/2005

2.5 Department Administration & Committees

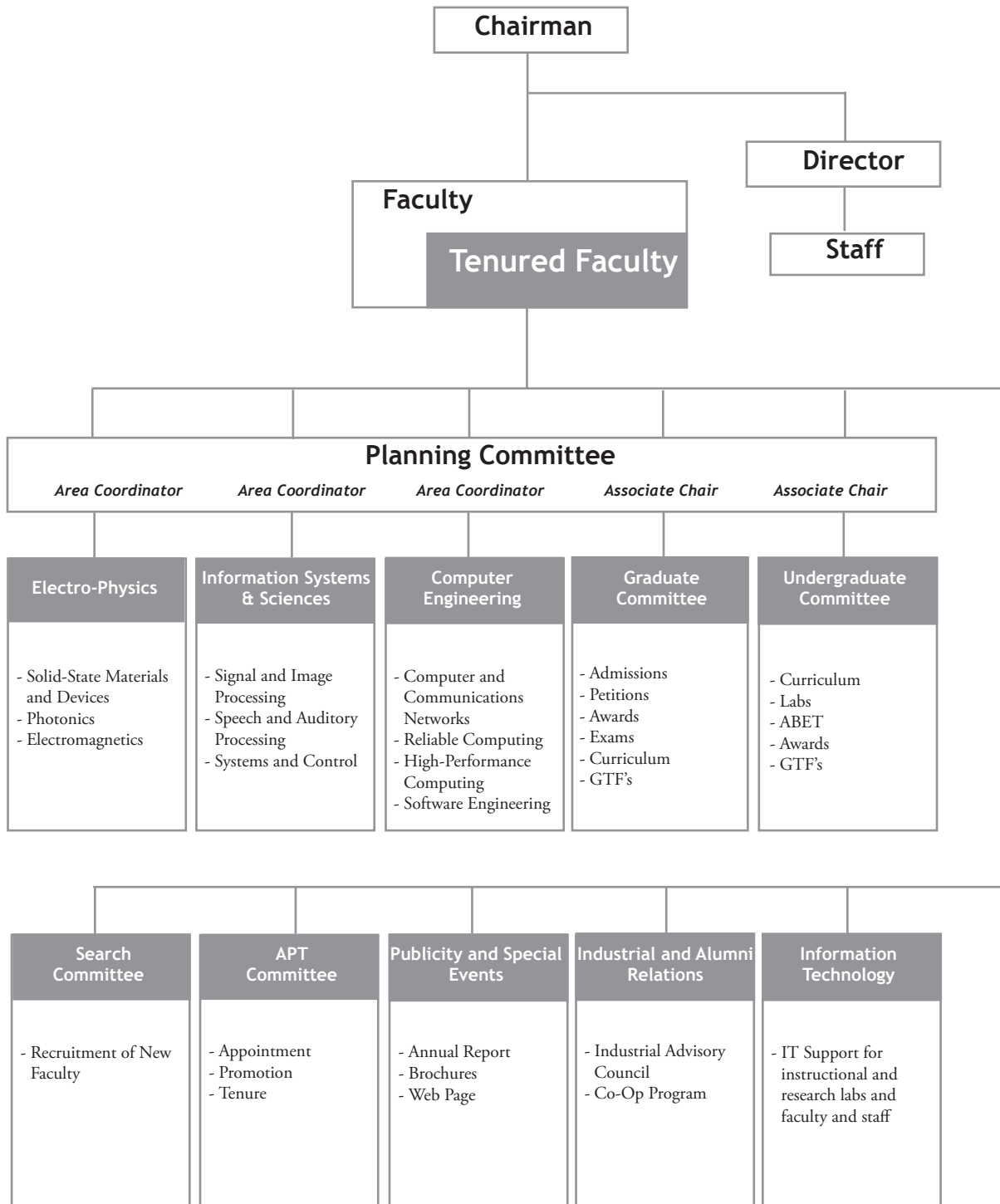
Saleh, Bahaa	<i>Department Chair</i>
Nawab, Hamid	<i>Associate Chair for Undergraduate Studies</i>
Ünlü, Selim	<i>Associate Chair for Graduate Studies</i>
Rennie, Wayne	<i>Department Director</i>

Faculty committees direct the academic operations and planning for the ECE Department. The Undergraduate and Graduate Committees are responsible for curricular and student affairs. The Planning Committee is comprised of the coordinators of the three areas of research and instruction (electro-physics, information systems and sciences, and computer engineering), the Chairman, Director, and the two Associate Chairs, and is responsible for strategic initiatives.

Planning Committee	Graduate Committee	Undergraduate Committee	Search Committee	APT Committee
Saleh (Chair) Ünlü (Assoc. Chair, Grad) Nawab (Assoc. Chair, Undergrad) Herbordt (CSE) Castañon (ISS) Ruane (Electro-Phys.) Rennie (Director)	Ünlü (Chair) Oliver (Assoc. Chair) Alanyali Bellotti Bigio Saligrama Semeter Taubin Trachtenberg	Nawab (Chair) Bystrom Carruthers Fahim Kincaid Roziner Ruane Starobinski	Saleh (Chair) Bystrom Carruthers Giles Herbordt Konrad Lee Moustakas Rennie (ex-officio) Sergienko Teich	Saleh (Chair) Brower Giles Karl Levitin Moustakas Rennie (ex-officio) Teich
Publicity, Special Events and Seminars	Industrial and Alumni Relations	Information Technology Committee	EK100 Advisors	Senior Design Advisors
Saleh (Chair) Ishwar (Spring) Karpovsky Konrad Kotiuga (RSS)* Pastore Qin Rennie Ruane Saligrama Toffoli	Saleh (Chair) Hubbard Kincaid Knepper Morse Pisano Rennie Skinner	Konrad (Chair) Bellotti Caine Giles Herbordt Hubbard Little (Spring) Rennie Toffoli	Alanyali Brackett Brower Bystrom Karl Lee Nawab Ruane Starobinski	Bystrom Carruthers Giles Horenstein Konrad Kotiuga Morse Pisano Toffoli Ünlü

* Research Spotlight Seminar

2.6 Department Organizational Chart



2.7 ECE Representation in the College of Engineering and the University

College of Engineering Committee	Faculty
APT Committee	Hubbard
Graduate Committee	Ünlü
Scholarship Exam Committee	Ünlü
Undergraduate Committee	Nawab
Math Exam Committee	Kincaid, Bystrom, Trachtenberg
Student Conduct Committee	Kincaid
Professional Practice Advisory Group	Knepper
COE Leap Advisor	Kincaid

University Committee	Faculty
Faculty Council Compensation Committee	Ruane (Chair)
Faculty Council	Giles (Chair), Ünlü, Ruane, Skocpol (CAS)
Patent Policy Committee	Moustakas
Student Conduct Committee	Ünlü
Committee on Research Activities and Libraries	Ünlü
Council Committee on University Procedures	Skocpol (Chair)

Advisory Group	Faculty
IEEE	Nawab
Minority Engineers' Society (MES)	Giles
Student Association of Graduate Engineers (SAGE)	Ruane
Society of Hispanic Professional Engineers (SHPE)	Castañón
Tau Beta Pi	Nawab, Bystrom (Spring '05)
Alpha Pi Omega	Ruane
Engineering House	Nawab

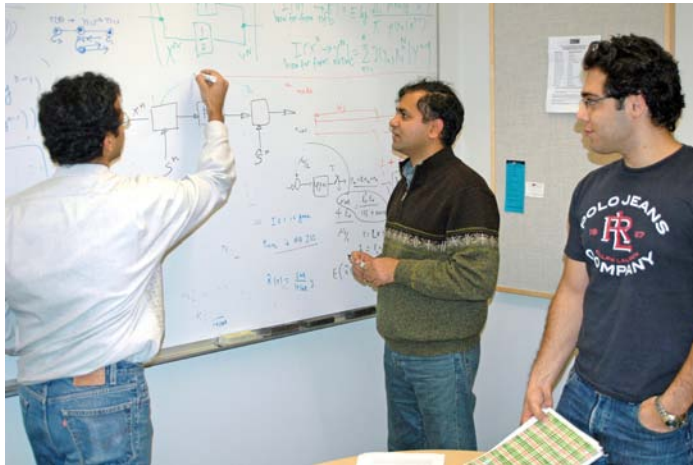
Other Representation	Faculty
University Board of Trustees	Giles (member)
Center for Computational Science	Giles (Deputy Director)
Center for Excellence in Teaching	Giles (member)

three: *Undergraduate Programs*

3.1 Academic Programs

ECE continues to pride itself in developing a strong laboratory curriculum to accompany our classroom teaching for undergraduates. Having moved into a new building in the Spring of 1997, we have excellent teaching labs with up-to-date equipment. Undergraduates are encouraged to get involved with research and development efforts in faculty labs, through UROP (Undergraduate Research Opportunity Program), work study, or student employment. Engineering is an applied science, and we believe it is important to start applying what is learned in the classroom as soon as possible.

Having been successful in gaining ABET re-accreditation for another six years, we have not lost our momentum in implementing the continual improvement cycles for our EE and CSE programs. This includes student surveys, student feedback forums, faculty review of courses and outcomes, and proposal and implementation of curriculum changes aimed at improving program outcomes.



Professors Venkatesh Saligrama and Prakash Ishwar discuss distributed source coding for sensor networks with graduate student Ehsan Afkhami.

Enrollment and Degrees Awarded

Fall 2004 Enrollment

	Electrical	Computer Systems	Total
Freshmen*	26	28	54
Sophomores*	25	23	48
Juniors	62	36	98
Seniors	60	50	110
Total	173	137	310

* Note: ENG students are not required to declare their major until their Junior year.

Degrees Awarded

Electrical Engineering	56
Computer Systems Engineering	48
Total	104

Honors Students

Summa Cum Laude	11
Magna Cum Laude	16
Cum Laude	12
Total	39

ECE Advising Day

Continuing a tradition initiated in 1998, each semester an ECE Advising Day was held just prior to the commencement of the web-based registration period. This year we held a student feedback forum (co-sponsored by the BU chapter of the IEEE) each semester to give ECE students (mostly juniors & seniors) the opportunity to voice their concerns and suggestions for improvements in our undergraduate programs. The main highlights of their feedback were:

- Greater degree of design experience desired in the junior year.
- More opportunities for technical writing and oral presentations desired in the junior year.
- More computer engineering modules recommended for the Introduction to Engineering course (EK130).

- Introductory Physics courses criticized as having too much review of high school physics.

- The computer science course on data structures (CAS CS112) criticized as having too much of a mismatch to its pre-requisite (ENG EK126) and to the follow-on course on algorithms (ENG SC330). Recommendation to teach an ENG version of CS112.

Teaching Workshops

The ECE tradition of holding teaching workshops every semester continued this year. Now a requirement (as course SC850) for all new graduate teaching fellows in the College of Engineering, six 1-hour workshops were held each semester. These workshops included panel and solo discussions as well as role-playing scenarios on teaching methodology, presentation



ECE Teaching Award 2004/2005

During the 1997-98 academic year, the ECE Department instituted an award to recognize innovation and excellence in teaching in the department. The award, based on nominations from College students, faculty, and staff, carries with it a \$1,000 prize to be used towards instructional activities. A committee of ECE professors and students evaluated the nominees. They looked at teaching statements and classroom material, sat in on classes, and collected comments from students.

Professor Maja Bystrom was the winner of the 2005 ECE Award for Excellence in Teaching. The 2005 ECE Teaching Award Committee, chaired by Professor Nawab, recommended this award.



College of Engineering Faculty Service Award

The College of Engineering Executive Board chooses a faculty member who has made outstanding contributions to the College through involvement in programs, committees, and organizations within the College and University.

Professor Hamid Nawab, Associate Chair for ECE Undergraduate Studies, was the winner of the 2005 Faculty Service Award.

3.2 Instructional Laboratories

Expenditures for Instructional Laboratories 2003-2004

Facility	Equipment	Approximate Cost
Microprocessor Lab and Software Engineering Lab	Lab kits, software licenses, maintenance, etc.	\$10,031.99
VLSI Lab and Signals/ Networks Lab	Software licenses, maintenance, etc.	\$52,074.62
Electronics Lab	Lab kits, electronics kits, maintenance, etc.	\$67,717.49
Senior Design Lab	Workstations, software licenses, etc.	\$2,953.81
Photonics/Optics Lab	Lab equipment and supplies, software, etc.	\$11,429.69
IMSIP Lab	Workstations, software licenses, etc.	\$720.00
Other	Network/Wireless Infrastructure upgrade, etc.	\$47,102.00
Total		\$192,029.60

Instructional Laboratories

Control Systems Laboratory

This laboratory houses 4 ECP model 220 Industrial Plant Emulators for studying the control of practical systems. These systems consist of an electromechanical apparatus including an adjustable mechanical mechanism (plant) with actuators and sensors. Various types of controllers (e.g. PID, State-Feedback, LQR) can be designed and implemented in either continuous or discrete time formulations using a DSP-based real-time controller with a Windows XP graphical interface. Non-ideal conditions that are often present in real-world applications can be studied. Integrated with the systems are MATLAB and SIMULINK design tools, which can be used to design control systems that can then be implemented in the hardware. Analytical models of both the “plant” and the “controller” can be validated with actual hardware responses.

Pisano

Electronic Design Automation/VLSI Laboratory

The VLSI Instructional Laboratory of the Department of Electrical and Computer Engineering (ECE) is involved in almost all aspects of digital design. We have a wide range of CAD tools available for student use, including Cadence, Synopsys, and the NCSU Design Toolkit. *Herbordt, Hubbard, Kincaid, Knepper, Roziner, Taubin*

Electronics Laboratory

The Electronics Laboratory has 30 stations, each equipped with a PC, GPIB-controlled Agilent test instruments and



National Instruments ELVIS development stations linked by LabVIEW. Sixteen stations have new LeCroy digital scopes. This facility supports introductory ECE courses in circuits and electronics with modern industry-standard equipment and software. The lab also supports more advanced experiments in signals and systems, communications, electromagnetics, and photonics. Senior design and project students use the lab on an open basis, and freshman EK130 modules are held here. A small parts window sells discrete components. OrCAD software including PSpice supports circuit simulations. *Nawab, Carruthers, Fahim, Horenstein, Knepper, Kotiuga, Lee, Oliver, Roziner, Ruane, Sergienko*

High Performance Computing Laboratory

The High Performance Computing Laboratory at Boston University was created with support from the National Science Foundation (NSF) in order to support the development of undergraduate courses in parallel and high performance computing. The courses offered at Boston University serve as a national model for computational science education. The lab features a network of multimedia graphics workstations linked at high speed to the supercomputers at the Center for Computational Science and the Scientific Computing and Visualization Lab. *Giles, Brower*

High Tech Tools and Toys Laboratory

HTTTTL is the instructional laboratory associated with Boston University's NSF-funded Engineering Research Center for Subsurface Sensing and Imaging Systems (CenSSIS). The laboratory houses a variety of PC-based imaging camera systems, machine vision systems and acoustic imaging systems.



Software for imaging includes MATLAB, Image Processing Toolbox, Image Builder, Vision Foundry, ENVI and LabVIEW. The HTTTTL supports freshman EK130 modules in imaging and subsurface imaging, senior design capstone projects in imaging, and experiments in senior level electives related to imaging. *Ruane*

IMSIP Instructional Laboratory

This laboratory serves graduate instructional needs of the department in the areas of multidimensional signal processing (including image and video processing), statistical signal processing, pattern recognition, as well as earth and space sciences. The laboratory provides advanced computational resources and associated software packages. Fast, dual processor workstations connected through a gigabit network form a computational backbone while high-capacity monochrome and color printers serve the hardcopy needs. State-of-the-art processing and optimization software is available. This laboratory was developed with funds from the National Science Foundation, and is currently being upgraded with departmental funds. *Karl, Konrad, Nawab, Oliver*

Microprocessor and PC Laboratory

This lab features instruction in the programming and interfacing of microcomputers and digital controllers. Higher-level courses emphasize the design of systems using microprocessors. Various simulators and analysis packages are available. *Toffoli, Giles, Skinner, Taubin*

Network Computing Laboratory

The Network Computing Laboratory studies interconnection network topologies; routing, network flow control, and deadlocks in multicomputer networks; multicast and broadcast, fault-tolerance in interconnection networks; modules for realization (nodes and routers); performance metrics and scalability; message passing interference, protocols and programming, scalable coherent interconnect (SCI), and distributed shared memory; network of workstations (NOW), case studies of high performance scalable networks, and cluster computing. *Karpovsky*

Photonics Laboratory

The Photonics Instructional Laboratory supports introductory and intermediate level courses in the MS in Photonics program. Four stations each have a vibration isolated optical table, HeNe and semiconductor lasers, fiber components and systems, electronic test equipment, and GPIB-connected PCs for LabVIEW data logging and instrument control. Shared equipment exists for experiments and demonstrations in interferometry, spectrometry, diffraction, holography, acoustic and electro-optic modulation, and optical spectrum analysis. A secure annex room houses two additional isolated tables, electronics and optical equipment to support thesis and senior design projects that require long-term setup of apparatus. *Ruane, Bigio, Morse, Paiella, Saleh, Teich, Ünlü*

Senior Project Laboratory

This lab supports our senior design teams, serving real-world customers such as NASA, Analog Devices, Boston public schools, social service agencies, artists, and small businesses, as well as faculty and staff across the University. Each team has twenty-four hour access to a permanent bench setup with a networked Pentium PC, benchtop GPIB-based HP test equipment, and software for schematic design, simulation, and PCB layout. Electronics and shop support is provided. Shared tools include high speed scopes, logic analyzers, spectrum analyzers, E-prom, PLA and FPGA burners, and various compilers and crosscompilers for DSP and micro-controller development. Software from MSDNAA is available for all teams. *Ruane, Knepper, Pisano*

Signals and Networks (SIGNET) Laboratory

This laboratory provides instructional facilities for courses in the areas of signal processing and communication networks. This laboratory houses numerous workstations for digital signal processing, image processing, and various real-time applications covering the complete audio frequency spectrum. Equipment includes Linux-based workstations, microphones, DSP boards, speakers, amplifiers, digital cameras, and software packages such as MATLAB and Hyperception. The courses served by this laboratory include SC401 (Signals and Systems), SC416 (Intro to Digital Signal Processing), SC 512 (Digital Signal Processing), and some ECE modules in EK130 (Introduction to Engineering). On the communications side, experiments involving data communication links, local-area networks, and wide-area networks are supported. Powerful computer-based simulation and analysis tools are available to compare and evaluate network designs. Facilities are also provided for experimentation with local-area network switching and routing hardware. *Bystrom, Carruthers, Kincaid, Konrad, Nawab*



Software Engineering Laboratory

An instructional and research lab, the Software Engineering Laboratory (SEL) supports courses and research on the economical design of reliable software for large-scale, computer-based systems. The laboratory provides a network of workstations running Windows XP and provides students with state-of-the-art development and modeling tools for the design, implementation and testing of distributed software systems. *Skinner, Brackett, Herboldt, Taubin, Toffoli, Trachtenberg*

3.3 Undergraduate Courses

Course Number and Title		Fall 04	Spring 05	Summer 05
EK131/EK132	Intro to Engineering	Ruane Kincaid Morse	Kincaid Lee Konrad Toffoli	
EK307	Electric Circuit Theory	Fahim Fahim	Fahim Roziner Roziner Fahim	Redjdal
EK317	Circuit Theory I	Oliver		
EK318	Circuit Theory II		Oliver	
SC311	Intro to Logic Design	Roziner Roziner	Kincaid Roziner	Ray
SC312	Computer Organization	Taubin Qin	Herbordt	
SC330	Applied Algorithms	Brower	Trachtenberg	
SC401	Signals and Systems	Kincaid	Castañón	Carruthers
SC402	Control Systems		Pisano	
SC410	Intro to Electronics	Horenstein Lee Lee Knepper Kotiuga	Lee	Fedyunin
SC412	Analog Electronics		Knepper	
SC415	Communication Systems	Carruthers	Carruthers	
SC416	Intro to Digital Signal Processing	Bystrom	Bystrom	Nawab
SC440	Intro to Operating Systems	Skinner	Skinner	
SC441	Intro to Computer Networks	Starobinski	Alanyali	
SC447	Software Design	Skinner		
SC450	Microprocessors	Giles	Giles Toffoli	
SC455	Electromagnetic Systems I	Semeter	Lee	
SC456	Electromagnetic Systems II	Lee		
SC463	Senior Design Project I	Ruane Pisano	Ruane	
SC464	Senior Design Project II	Ruane	Ruane Knepper	
SC471	Physics of Semiconductor Devices	Moustakas		
SC500	Special Topics in ECE	Ziph-Schatzberg Kotiuga Skinner	Qin	
SC501	Dynamic Systems Theory	Dupont		
SC505	Stochastic Processes	Karl	Saligrama	
SC513	Computer Architecture	Herbordt		
SC514	Simulation	Vakili		
SC515	Digital Communication	Saligrama		
SC516	Digital Signal Processing	Nawab	Ishwar	
SC518	Software Project Management		Brackett	
SC520	Image Processing and Communication	Konrad		
SC524	Optimization Theory and Methods	Paschalidis		
SC533	Intro to Discrete Mathematics	Levitin		
SC534	Discrete Stochastic Models		Levitin	
SC541	Computer Communication Networks	Alanyali	Starobinski	
SC551	Advanced Digital Design	Taubin		
SC560	Intro to Photonics	Paiella	Saleh	
SC561	Error-Control Codes	Karpovsky		
SC563	Fiber-Optic Communication Systems		Morse	
SC568	Optical Fiber Sensors	Morse		
SC570	Lasers and Applications		Teich	
SC571	VLSI Principles and Applications	Hubbard	Hubbard	
SC575	Semiconductor Devices	Bellotti		
SC577	Solid State Devices		Paiella	
SC578	Fabrication Technology for Integrated Systems	Klepstyn		
SC579	Microelectronic Device Manufacturing		Cole	
SC580	Modern Active Circuit Design	Knepper		

3.4 ECE Day Senior Projects

All ECE seniors complete a team-based, two semester capstone design project. Teams must design and prototype a product, electronic device, or software system for a real-life “customer.” Customers are drawn from industry, small businesses, community groups, and faculty and staff. Initially students learn design methods, project management, team dynamics, communication skills, and legal and ethical standards for design. They form teams, research their project concept, and prepare quad charts, white papers and finally a project proposal. A substantial “first-deliverable” milestone and oral presentation complete the first semester. The second semester is spent in the Senior Project Laboratory, PHO111/113. Students make presentations to their customer, write engineering memos, design their project to meet customer specifications, manage the project budget, and deliver their working prototype, including a detailed user’s manual. Project records are maintained in personal design logbooks. Teams have 24/7 access to their dedicated, fully-equipped laboratory bench, and can use professional CAD and prototyping tools for circuits, embedded systems, and software development. On ECE Day, May 5, 2005, 21 teams and one BS Honors Thesis student presented their projects in two parallel sessions. Best presentation awards were given in each session and a luncheon for faculty, customers and seniors was held.

Teams are encouraged to participate in external design contests. The Dinghies team (Project SailTrac; Matt Gorelik, Gavin Gray, Josh Nicholson, and Geoffrey Rowland; customer: BU Dinghies Sailing Team) competed in the Region I ASEE Student Design Competition in Connecticut in April. The BUPATS team (Project iPark; Ido Hochman, Kenneth Lopez, Michael Mole, Patrick Ward; customers Prof. Karl and Prof. Konrad) competed May 7 at Rochester Institute of Technology in SDC 5, the IEEE Student Design Contest, earning first place among 22 teams from the northeast and Canada. See: <http://www.rit.edu/~631ieec/sdc5/teams.shtml>.

2005 P.T. Hsu Award

Since 1982, ECE has honored Professor P.T. Hsu, by acknowledging the best overall ECE capstone design project with the P.T. Hsu Award. A faculty selection committee considers degree of success, difficulty, scope, creativity, cost, project communications, and team effectiveness.



AudioOptitronics’ corner cube mirror under laser illumination. Note the pattern imposed by the modulator.

Team AudioOptitronics (Project MEMS Optical Audio Transmitter; Michael Chalson, Michael Datta, Arpan Salva, Andrew Schwartz; customer: Prof. Thomas Bifano and Boston Micro Machines) was the 2005 winner of the P.T. Hsu Award. The MEMS Optical Audio Transmitter created a communication system utilizing the technology of a MEMS deformable mirror built by Boston Micro Machines. Their battery-driven modulation unit takes a microphone or iPod audio input and outputs a high-voltage, frequency-modulated signal to the MEMS mirror. An interface board, on which the mirror is mounted, rapidly writes a striped diffraction pattern into the pixels of the mirror, reflecting the incoming laser either on or off target, effectively encoding the audio into the laser. Because the MEMS mirror is the face of a corner cube, the encoded signal is sent back to the transmitting laser, where it is optically sensed and demodulated. This system will allow a user to be a passive modulator of the interrogating laser, with applications in sensing and secure communications.

Notable Seniors Projects 2004-2005

Team 15 - BUPATS
Ido Hochman
Kenneth Lopez
Michael Mole
Patrick Ward



Parking Garage Monitoring System

iPark offers a solution through a vision-based monitoring system that detects free parking spaces in indoor parking lots. iPark utilizes wireless cameras (as opposed to embedded sensors) so that changes to existing infrastructure are not required, thus minimizing installation costs.

Team - 4 JCB^2

Brandon Bettencourt
Benjamin Chang
Joshua Kim
Christina Mexicano

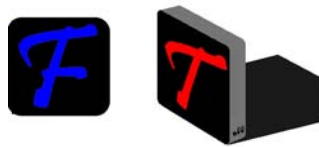


Cigarette Smoke Detector

Boston City Hospital and Prof. Ruane, ECE
JCB^2's ultra-sensitive Cigarette Smoke Detector implements an SB-AQ4 gas sensor which detects cigarette smoke across its thin platinum wire. This detected change is fed to a microprocessor controlled circuit which sets an alarm and alerts the nurse's station. This compact yet effective design has been implemented onto a PCB to allow for manufacturability.

Team 6 - TetraVida Tech

Jonathan Alelis
Matthew Chan
Stephen Ruete
Ke Yang Wang



Choreographed LED Display

David Durlach, Technofrolics, Cambridge, MA
The product is a system of letters, numbers, and symbols called Form Elements. Each uses ultra bright RGB LEDs choreographed by a microcontroller, and is powered by both internal batteries and an external power source. This design is not a conventional dot-matrix display, but a number of LEDs arranged to form a stylized letter.

Team 19 - Cyneclo Orp

Morgan Lindsay
Robert Oppen
Kalim Saliba
Jeffrey Zuccaro

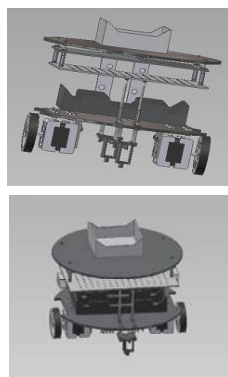


SPI Controlled LCD Module

Zahar Raskin, P&E Micro, Boston, MA
Our LCD module provides a textual user display and a means of interacting with the Cyclone Max via four buttons. This interaction occurs through an HC08 microprocessor which sends and receives information from the Cyclone Max via the SPI interface. This information is then printed onto the LCD and the user is allowed to scroll through the information, select an appropriate choice, and send this choice back to the Cyclone Max.

Team 21 - Moto-Pilots

Suzanne Chan
Tian Rong Chen
Alan Lee
Johnny Ng



Motion Planning Unmanned Ground Vehicle

Professor Alanyali & Professor Saligrama, ECE
Our unmanned ground vehicle (UGV) will be used to aid our customer's research in the localization of wireless sensor networks on an autonomous platform. The robot will carry a beacon and can follow a path defined by up to 100 way points.

3.5 Student Activities

The ECE Department supports two active undergraduate students groups, an IEEE Student Section and the Eta Kappa Nu honor society, which was founded in 2003. These groups both held a number of successful events this past year, ranging from lectures and panel presentations to social events for members to educational service activities. Events for 2004-2005 are detailed below.

The Second Annual ECE Department Constructive Feedback Forum

The BU student chapter of the IEEE, along with the Department of Electrical and Computer Engineering and HKN, organized The Second Annual ECE Department Constructive Feedback Forum. The main focus of this year's forum was on how students choose to pursue Electrical and Computer Engineering. A panel of ECE students gave their thoughts, along with comments from ECE Department representatives. The IEEE student officers also shared the results from a survey that was distributed among the students. Afterwards, there was an open discussion where students expressed recommendations and criticisms outside of the evaluation sheets filled out at the end of courses.

IEEE Student Leadership Training Workshop at WPI

A group of IEEE student officers took part of the IEEE Student Leadership Training Workshop at WPI.

IEEE Meeting with Guest Speaker John Bianco from Ropes & Gray Law Firm

IEEE sponsored a presentation about career opportunities in patent law by Ropes & Gray, LLC (<http://www.ropesgray.com>).

IEEE Meeting with Guest Speaker Jennifer Powers, Electrical Engineer At Cosentini Associates, Inc., Consulting Engineers

Students had a chance to learn about the work that Ms. Powers does as an Electrical Engineer, designing the lighting and electrical systems of large office buildings, schools, hospitals, etc. Ms. Powers showed the students her latest project, the electrical system of a museum.

The Changing Face of Product Development in

Today's Electronics Industry

Chris Wey, a Business Strategist in IBM's Engineering & Technology Services Division, talked about his development and marketing experience in semiconductors. He joined IBM upon graduation with a BS in Electrical Engineering from Boston University in May, 1998. In his role as Business Strategist, Chris specializes in identifying new market opportunities and developing client relationships for IBM's emerging engineering services and consulting business.

Process and Environmental Variation Impacts on ASIC Timing

The IEEE student section hosted a meeting with another IBM guest speaker, Paul Zuchowski. A Senior Technical Staff Member with IBM's Systems and Technology Group in Burlington, Vermont, Mr. Zuchowski is currently working on the implementation of the 65-nanometer ASIC chip design methodology. He received a Bachelor of Science degree in electrical and computer engineering from Clarkson University in 1989. In 1995, he received an M.S. in microelectronic manufacturing from Rensselaer Polytechnic Institute. Since joining IBM Burlington in 1989, Mr. Zuchowski has worked on full-chip physical verification, ASIC design methodology and ASIC product architecture. He currently holds thirteen patents, with another eleven pending, and is the author of ten papers. He was an initial member of the team that brought IBM ASICs to the original equipment manufacturer market. IBM has been the #1 ASICs supplier for the last five years.

IEEE Meeting with Guest Speaker Heather Schmidt from BAE Systems

Heather Schmidt, BU College of Engineering graduate, of BAE Systems joined IEEE members for a talk on career development and utilizing career resources. She also spoke about what it is like to work for a defense contractor and talked about BAE Systems and their Engineering Leadership Program. BAE Systems is an international company engaged in the development, delivery and support of advanced defense and aerospace systems in the air, on land, at sea and in space.

Educational Activities

- Kaplan 10 Question Challenge
- IEEE hosted an information session about the GRE

Other Activities

- EK100 Student Organizations Fair
- Anheuser-Busch Tour
- General Meetings
- ENG Career Fair
- MIT Media Lab - Smart City Cars in the 21st Century Exhibit
- Quake III Arena Tournament (only freshmen - EK100)
- BU IEEE Movie Nights
- BU IEEE T-shirt design competition

Eta Kappa Nu Honor Society

The Kappa Sigma Chapter of Eta Kappa Nu (HKN), the National Society of Electrical and Computer Engineering, was established here at Boston University on March 21, 2003. Today, as a newly established chapter, HKN is trying to keep its mission in helping students achieve their academic goals by launching an ECE tutoring program in which the members of HKN volunteer their time to help undergraduates in their coursework.

3.6 Continual Program Improvement

The basic cycles for improving our undergraduate programs continued during AY 2004/05. The highlights this year were:

- Responding to prior feedback from ECE undergraduates that the probability and statistics material is not well integrated into our curriculum, the ECE Undergraduate Committee proposed a new course – Probability for Electrical & Computer Engineers. This course is designed to introduce students to basic probability concepts while pointing out their relevance to EE and CSE applications (e.g. packet-switched networks, optical systems, signal detection in noise). The course has circuit theory and logic design as pre-requisites in order to ensure that students can understand how probability is relevant in ECE applications. The ECE faculty has approved this course and approved its inclusion in the EE and CSE curricula to satisfy the probability requirement. The course is planned to be taught for the first time in Spring 2006.
- A detailed review of Introduction to Circuit Theory (EK307) was conducted by the ECE Undergraduate Committee. The course material was reviewed and the course faculty were interviewed. Based on the review, the Undergraduate Committee has recommended that (1) the EK 307 laboratory experiments be updated and that some of the laboratory content be moved to a separate course, (2) the enrollment in each EK 307 lecture section be limited to a maximum of 40, and (3) the number of discussion hours be increased to 2 hours per week.
- Student surveys were conducted to collect and analyze data on student perceptions of how well our programs are achieving their outcomes.
- Student feedback forums were held in the Fall and Spring semesters for ECE students to express their concerns and suggestion for improvements in the EE and CSE programs.
- At an ECE Faculty Retreat in May 2005, the faculty discussed and endorsed the idea of using a single device (such as a cellular phone) as a common theme to be addressed in various ways in different core courses. The objective here is to enhance the ability of our students to make connections between the material presented in different courses. By endorsing the idea, the ECE faculty has committed itself to make a concerted effort to incorporate such a common theme into the common courses in the near future.

four: Graduate Programs

4.1 Course and Program Development

During the 2004-2005 academic year, efforts to refine the ECE curriculum continued. A new variable credit course was developed to allow for the introduction of laboratory courses to the ECE course inventory, to begin in Fall 2005. The subject of the Advanced Laboratory Topics in Electrical and Computer Engineering (SC599) will vary from year to year and is expected to generate from an area of current or emerging research. In the Spring 2005 semester, a 2-credit Photonics Lab course was developed by Professor Paiella to complement introductory graduate courses in Photonics. This new course will be offered as SC599 in the Fall semester. Several new laboratory courses are expected to be developed using this new mechanism. After the first semester, courses which were taught as SC599 will be assigned permanent course numbers, in the same procedure that handles SC500 and SC700 courses.

The decision was made to reduce the 2 credit Graduate Teaching Seminar course (SC850) to a zero credit course. This change was made to accommodate Graduate Teaching Fellows, allowing them to take full advantage of courses that are included in their degree program while still remaining at a part-time tuition status.

Several new courses have been developed and were either offered during 2004-2005 or are to be offered in Fall 2005 as special topics. In Fall 2004, SC500 Enterprise Client-Server Software Systems by Professor Skinner, SC500 Electromagnetic Modeling by Professor Kotiuga, and SC500 Fundamental Optical Design by Leah Ziph-Schatzberg (of the Photonics Center) were offered. In Spring 2005, SC700 Radar Remote Sensing by Professor Semeter and SC500 Introduction to Embedded Systems by Professor Qin were offered. To be offered in Fall 2005 are SC700 Personal Knowledge Engineering Project by Professor Toffoli and SC/MN500 Networking the Physical World by Professor Little. In Fall 2005, BE/SC700 Advanced Optical Microscopy and Biological Imaging by Professor Mertz from the Biomedical Engineering department will also be offered as a cross-listed course in ECE.

The PhD student database and the web portal (<http://www.bu.edu/ece/grad>) continue to provide simple and rapid access to PhD student records for the ECE faculty and administration. In another move to improve access to records, the College of Engineering and ECE have been working on improving forms and procedures related to a variety of different contracts. Forms requiring signatures, including RA contracts, are generated in paper form, then are scanned and stored in electronic format for easy access.

4.2 Graduate Student Recruitment

In Fall 2004, five Dean's Research Fellows began matriculation in ECE – four PhD students and one MS student. All four PhD students will be continuing their degree programs and all are making excellent progress in their programs. We have five incoming DRF's for the Fall 2005 semester.

We received 557 applications for the Fall 2005 semester, up slightly from 544 in Fall 2004. In Fall 2004, there were a total of 434 admits, with 160 MS admits, 163 post-BS PhD admits, and 111 post-MS PhD admits, but this does include those that asked not to be admitted without aid. In Fall 2005, there were a total of 310 admits, with 246 MS admits (105 of these applied for the post-BS PhD), 38 post-BS PhD admits, and 26 post-MS PhD admits.

As can be seen from these numbers, the admissions process is now much more selective in respect to PhD students. We now require a clear path to continued financial aid for the applicants. We have also refined the guidelines and procedures for admissions, resulting in the first round of financial aid offers to be made several weeks earlier compared to previous years. As the graduate program grows, we expect to have about 20-30 PhD students begin matriculating each year.

This year, ECE held two open house events instead of one. This allowed for more non-local applicants to be invited. The events were held on back to back weekends with a similar agenda to that of the year before. Between both weekends, there were a total of 20 applicants in attendance. Fifteen of these 20 were non-local, in contrast to 11 of 20 attendees at the 2004 open house event. All 15 of the non-local 2005 attendees were partially funded by the College of Engineering, as opposed to 10 of the non-local 2004 attendees.



Professor Murat Alanyali and graduate student Ashraf Al Daoud discussing control mechanisms for data networks.

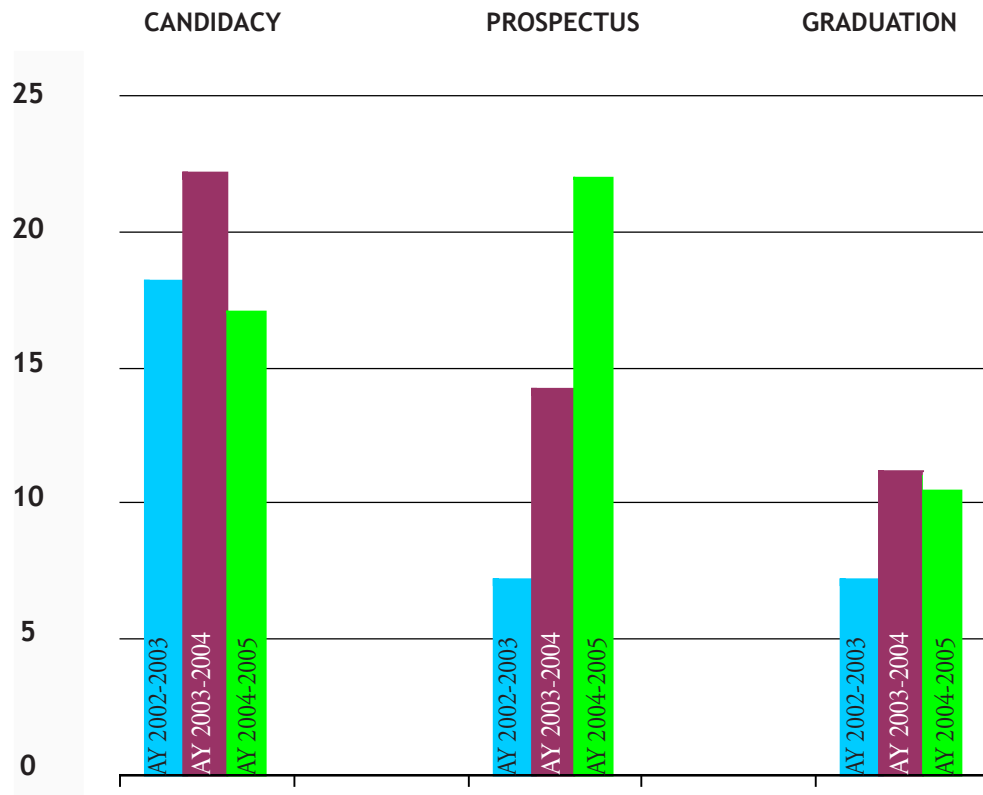
4.3 PhD Graduate Student Progress

The number of PhD graduates per year is an important measure of the strength of the graduate programs. The PhD program has continued to grow and the Graduate Committee has implemented new procedural improvements to ensure that this progress of the student population is kept on track. Last year, a more efficient tracking system was implemented, allowing us to enforce the deadlines on PhD candidates, including that of the prospectus defense. Students are required to pass their prospectus defense within two years of achieving PhD candidacy. Defending the PhD prospectus within these bounds will allow students to focus on their dissertation research and complete their degrees in a timely manner. The chart below shows the number of PhD students achieving candidacy (completing qualifying exam requirements), completing prospectus defense, and graduating over the last three academic years. While the number of new PhD candidates per year is steady around 20 per year, those completing prospectus exams have increased significantly. With a time-lag of several years, we expect a similar rise in the number of PhD degrees being awarded and reach 20 students graduating annually within the next several years.

4.4 Colloquia and Seminars

The ECE Colloquium Series and the Research Spotlight Series (RSS) continued for another successful year. Prominent speakers from both inside and outside the University gave research talks on current issues. Graduate students continued to attend and contribute to both these events. We expect that graduate students will continue to participate in both the Colloquium Series and RSS in future semesters.

A list of speakers for the academic year for these two seminar series, as well as other relevant seminars, is given on pages 4-14 through 4-17.



4.5 New Matriculants

New Students Entering 2004-2005

		Male	Female	FT	PT	GTF	RA	Fellow	DRF
MS	US	25	2	26	1	0	0	0	1
	Intl.	15	3	17	1	3	1	0	0
Ph.D.	US	10	4	11	3	4	2	0	3
	Intl.	12	5	16	1	5	5	0	1
Total		62	14	70	6	12	8	0	5

Fall 2004 Mean GRE Scores

		Verbal	%	Quantitative	%	Analytical	%	Analytical Writing	%
MS	US	508	59	749	81	669	72	4.5	49
	Intl.	488	54	754	83	684	77	4.0	33
PhD	US	543	68	757	83	702	82	4.8	57
	Intl.	572	72	787	92	746	89	4.3	39
Mean		528	63	762	85	700	80	4.4	45

Spring 2005 Mean GRE Scores

		Verbal	%	Quantitative	%	Analytical	%	Analytical Writing	%
MS	US	503	59	758	83	705	84	4.6	53
	Intl.	505	58	748	80	770	93	4.1	37
PhD	US	505	60	740	80	650	72	4.5	52
	Intl.	537	62	777	86	800	97	4.0	33
Mean		513	60	756	82	731	87	4.3	44

4.6 MS Students

Student Name	Advisor	Research Area or Thesis Title
Adamson, Benjamin	Hubbard, Allyn E	Electrical Engineering
Afkhami, Ehsan*	Saligrama, Venkatesh	Electrical Engineering
Al Daoud, Ashraf*	Alanyali, Murat	Controlling Selfish Traffic in Feed-Forward Packet-Switched Networks
Al Masri, Marwan	Taubin, Alexander	Computer Systems Engineering
Aldridge, John	Ruane, Michael	Photonics
Almeida, Nuno*	Bellotti, Enrico	Electrical Engineering
Atkinson, John	Kincaid, Thomas G	Electrical Engineering
Ayoade, Kolawole	Alanyali, Murat	Computer Systems Engineering
Azua, Tommy*	Bellotti, Enrico	Electrical Engineering
Basiaga, Dariusz*	Levitin, Lev B	Photonics
Bassotti, Mark*	Herbordt, Martin C	Computer Systems Engineering
Biello, Michael*	Starobinski, David	Computer Systems Engineering
Brunina, Daniel*	Herbordt, Martin C	Computer Systems Engineering
Cao, Huanwen	Konrad, Janusz	Electrical Engineering
Carsow, Douglas	Toffoli, Tommaso	Electrical Engineering
Cassell, Brian*	Roziner, Tatyana D	Computer Systems Engineering
Chan, Chun-Wei	Konrad, Janusz	Electrical Engineering
Chang Chien, Ching-Heng*	Oliver Jr, William L	Electrical Engineering
Chawla, Vikas	Carruthers, Jeffrey B	Computer Systems Engineering
Chen, Kan*	Toffoli, Tommaso	Computer Systems Engineering
Chow, Melissa*	Hubbard, Allyn E	Electrical Engineering
Christiaanse, Catherine*	Bellotti, Enrico	Electrical Engineering
Ciriello, Sarah*	Kincaid, Thomas G	Electrical Engineering
Danawi, Sarya*	Roziner, Tatyana D	Computer Systems Engineering
Davenport, Jason*	Roziner, Tatyana D	Computer Systems Engineering
Diaz Quezada, Marcos*	Oliver Jr, William L	Electrical Engineering
DiSabello, Douglas	Herbordt, Martin C	Computer Systems Engineering
DiSimone, Christopher	Saligrama, Venkatesh	Electrical Engineering
Donnenfeld, Michael*	Herbordt, Martin C	Electrical Engineering
Doros, Michael	Alanyali, Murat	Computer Systems Engineering
D'Orsogna, Danilo	Bellotti, Enrico	Electrical Engineering
Driscoll, Kristina*	Bigio, Irving	Electrical Engineering
Dua, Aarti*	Herbordt, Martin C	Computer Systems Engineering
Dutta, Madhuparna	Ünlü, M Selim	Electrical Engineering
Eizenberg, Zvi	Konrad, Janusz	Electrical Engineering
El Katerji, Ahrnad	Giles, Roscoe C	Computer Systems Engineering
Ermis, Erhan*	Konrad, Janusz	Adaptive Statistical Strategies for Distributed Detection of Localized Phenomena In Sensor Networks
France, Ryan	Moustakas, Theodore	Electrical Engineering
Garnier, Robert	Taubin, Alexander	Electrical Engineering
George, John*	Kotiuga, P Robert	Electrical Engineering
Gioux, Sylvain	Ünlü, M Selim	Photonics
Gray, Gavin*	Carruthers, Jeffrey B	Computer Systems Engineering
Gupta, Vikas	Herbordt, Martin C	Electrical Engineering
Han, Shih-Yen	Oliver Jr, William L	Electrical Engineering
Hashim, Zaileena	Kincaid, Thomas G	Electrical Engineering
Hemdan, Wael	Knepper, Ronald W	Electrical Engineering
Hsu, Hong-Jen	Trachtenberg, Ari	Electrical Engineering
Huang, Chiao-Chi	Herbordt, Martin C	Computer Systems Engineering
Ignjatovic, Milena	Carruthers, Jeffrey B	Electrical Engineering
Imhausen, Brian*	Sergienko, Alexander V	Electrical Engineering
Issa, Jerome	Teich, Malvin C	Electrical Engineering
Jain, Ashish	Konrad, Janusz	Electrical Engineering
Joo, Eduardo	Taubin, Alexander	Computer Systems Engineering
Kim, Soo Il*	Herbordt, Martin C	Computer Systems Engineering
Kulenica, Ervin*	Paiella, Roberto	Photonics
Lai, Vincent*	Trachtenberg, Ari	Computer Systems Engineering
LaRosa, Gregory	Paiella, Roberto	Photonics
Leonard, Edward*	Ruane, Michael	Electrical Engineering

Student Name	Advisor	Research Area or Thesis Title
Li, Ning	Morse, Theodore	Electrical Engineering
Liu, Jie	Hubbard, Allyn E	Computer Systems Engineering
Liu, Si Ming	Alanyali, Murat	Electrical Engineering
Lopez, Mariela*	Oliver Jr, William L	Electrical Engineering
Lu, Ye*	Bystrom, Maja E	Electrical Engineering
Lutzer, Christiaan*	Trachtenberg, Ari	A Watchdog Synchronization Algorithm for Distributed, Concurrent, and Networked Objects
Lyla, Gary*	Giles, Roscoe C	Electrical Engineering
Lynch, Eric*	Ünlü, M Selim	Electrical Engineering
MacDonald, Daniel*	Taubin, Alexander	A Balanced-Power Domino-Style Standard Cell Library for Fine-Grain Asynchronous Pipelined Design to Resist Differential Power Analysis Attacks
Machado, Emanuel Tito	Oliver Jr, William L	Electrical Engineering
MacKenzie, Alexander*	Nawab, Syed Hamid	Electrical Engineering
Mazooji, Mohammad	Patella, Roberto	Electrical Engineering
McClure, Marc	Skinner, Thomas P	Computer Systems Engineering
Mehta, Nehal*	Karpovsky, Mark	Computer Systems Engineering
Menn, Steven	Ünlü, M Selim	Electrical Engineering
Meydbray, Yevgeny	Bellotti, Enrico	Electrical Engineering
Misic, Mead	Knepper, Ronald W	Electrical Engineering
Mitchell, Brian	Carruthers, Jeffrey B	Electrical Engineering
Mitsch, Patrick	Carruthers, Jeffrey B	Computer Systems Engineering
Movaghar, Azhand*	Hubbard, Allyn E	Electrical Engineering
Mundada, Vikas*	Moustakas, Theodore	Electrical Engineering
Nandakumar, Hymavathi*	Alanyali, Murat	Electrical Engineering
Narayan, Savitha*	Trachtenberg, Ari	Computer Systems Engineering
Nasveschuk, Peter	Bellotti, Enrico	Electrical Engineering
Owen, Russell	Bellotti, Enrico	Electrical Engineering
Patel, Mitul	Karpovsky, Mark	Computer Systems Engineering
Pham, Lyndon*	Kincaid, Thomas G	ENG 23 0909 A Electrical Engineering
Pikalo, Oleksiy*	Saleh, Bahaa E A	Photonics
Powers, Matthew	Carruthers, Jeffrey B	Electrical Engineering
Praino, Julie*	Saleh, Bahaa E A	Electrical Engineering
Quesnel, Justin	Ünlü, M Selim	Electrical Engineering
Radtke, Mark*	Brackett, John W	Computer Systems Engineering
Rahman, Rashedur	Castañón, David A	Electrical Engineering
Rao, Seema*	Karpovsky, Mark	Computer Systems Engineering
Rao, Suyog*	Toffoli, Tommaso	Computer Systems Engineering
Rao Karikurve, Sharath	Karl, William C	Electrical Engineering
Raybardhan, Amit*	Knepper, Ronald W	Electrical Engineering
Reese, Gilbert	Carruthers, Jeffrey B	Computer Systems Engineering
Rendon, Christian*	Hubbard, Allyn E	Electrical Engineering
Romaniuk, Alex	Konrad, Janusz	Electrical Engineering
Rowland, Geoffrey*	Trachtenberg, Ari	Computer Systems Engineering
Roy, Sanchita	Giles, Roscoe C	Computer Systems Engineering
Said, Mohamad	Nawab, Syed Hamid	Computer Systems Engineering
Saralaya, Kiran*	Toffoli, Tommaso	Computer Systems Engineering
Sardo, Brian*	Hubbard, Allyn E	Computer Systems Engineering
Shah, Kartik	Alanyali, Murat	Electrical Engineering
Shekher, Parag*	Kincaid, Thomas G	Electrical Engineering
Shekher, Rahul*	Nawab, Syed Hamid	Electrical Engineering
Shibata, Kosaku*	Ruane, Michael	Electrical Engineering
Skaf, Antoine*	Kotiuga, P Robert	Electrical Engineering
Srinuanchi, Worrawat	Bystrom, Maia E	Computer Systems Engineering
Srivastava, Rashmi*	Nawab, Syed Hamid	Computer Systems Engineering
Steele, Joshua	Teich, Malvin C	Electrical Engineering
Stewart, Jason*	Bifano, Thomas G	Electrical Engineering
Subramanian, Krishnakumar	Castañón, David A	Electrical Engineering

Student Name	Advisor	Research Area or Thesis Title
Sumorok, Daniel*	Horenstein, Mark N	Electrical Engineering
Thulin, Lukas	Levitin, Lev B	Photonics
Tin Muang, Latt	Hubbard, Allyn E	Computer Systems Engineering
Tonkinson, Michael*	Bellotti, Enrico	Electrical Engineering
Vaddi, Murali*	Herbordt, Martin C	Computer Systems Engineering
Vellanki, Harshavardhan*	Bellotti, Enrico	Optimizing for Scattering Electron Problem
Voss, David	Fahim, Azza A	Electrical Engineering
Wang, Kai*	Ruane, Michael	Electrical Engineering
Wang, Chun-Kai	Levitin, Lev B	Computer Systems Engineering
Ward, Nicole	Kincaid, Thomas G	Electrical Engineering
Wei, Chih-Chung*	Bystrom, Maja E	Electrical Engineering
Westfried, Jerome	Carruthers, Jeffrey B	Computer Systems Engineering
Williams, Cliff*	Sargienko, Alexander V	Photonics
Wong, Wai Yan	Ünlü, M Selim	Photonics
Yalcin, Ayca*	Ünlü, M Selim	Optical Sensing of Biomolecules Using Mirroring Resonators
Yang, Cheng-Yu	Starobinski, David	Electrical Engineering
Yoon, Ji Sun*	Taubin, Alexander	Computer Systems Engineering
Zachariah, Ranjith*	Paiella, Roberto	Electrical Engineering
Zhao, Wei*	Konrad, Janusz	Electrical Engineering
Zhou, Yunsheng*	Brackett, John W	Computer Systems Engineering

**degree received in 2004/2005*

4.7 PhD Students

Student Name	Advisor	Research Area or Thesis Title
Abell, Joshua	Moustakas, Theodore	Electrical Engineering
Abu Ayyash, Salma	Little, Thomas D C	Electrical Engineering
Aeron, Shuchin	Saligrama, Venkatesh	Electrical Engineering
Agarwal, Ashish	Little, Thomas D C	Computer Engineering
Agarwal, Sachin	Trachtenberg, Ari	Computer Engineering
Almeida, Nuno	Bellotti, Enrico	Electrical Engineering
Atia, George	Kincaid, Thomas G	Electrical Engineering
Bach, Edward	Toffoli, Tommaso	Computer Engineering
Bergstein, David	Ünlü, M Selim	Electrical Engineering
Beriont, Walter	Levitin, Lev B	Computer Engineering
Bhattacharyya, Anirban*	Moustakas, Theodore	III-Nitride Ultraviolet Emitters Produced by Molecular Beam Epitaxy
Borogovac, Tarik	Carruthers, Jeffrey B	Systems Engineering
Bozinovic, Nikola	Konrad, Janusz	Electrical Engineering
Butler, Thomas	Saligrama, Venkatesh	Electrical Engineering
Bynoe, Wayne*	Carruthers, Jeffrey B	Effects of Simulcasting on the Performance of Multi-Hop Wireless Local Area Networks
Byrnes, John	Semeter, Joshua L	Electrical Engineering
Cabalu, Jasper	Moustakas, Theodore	Electrical Engineering
Chandrasekaran, Ramya	Moustakas, Theodore	Electrical Engineering
Chang, Shey-Sheen	Nawab, Syed Hamid	Electrical Engineering
Chen, Tai-Chou	Moustakas, Theodore	Electrical Engineering
Chen, Fangyi*	Hubbard, Allyn E	A Hydro-Mechanical Biomimetic Cochlea: Experiments and Models
Chivas, Robert	Morse, Theodore	Electrical Engineering
Coleiny, Golshan	Morse, Theodore	Electrical Engineering
Colerico, Marlene*	Mendillo, Michael	Characterization and Modeling of the Upper Atmosphere's Midnight Temperature Maximum Using Ground-Based Optical Observations
Coles, Michael#	Hubbard, Allyn E	Computer Engineering
Cui, Yanhong	Horenstein, Mark N	Electrical Engineering
Cunha, Michael	Bellotti, Enrico	Electrical Engineering
Cvetkovski, Andrej	Bystrom, Maja E	Electrical Engineering
Dai, Haitao	Knepper, Ronald W	Electrical Engineering
Davis, Brynmor	Karl, William C	Electrical Engineering
Debitetto, Paul	Karl, William C	Systems Engineering
Diaz Quezada, Marcos	Semeter, Joshua L	Electrical Engineering
Dobson, Jennifer	Bigio, Irving J	Electrical Engineering
Dosunmu, Olufemi*	Ünlü, M Selim	High-Performance Germanium Photodetectors on Silicon Reflecting Substrates for Long-Haul Optical Communications
Driscoll, Kristina	Paiella, Roberto	Electrical Engineering
Dutta, Madhuparna	Paiella, Roberto	Computer Engineering
Egorov, Roman	Levitin, Lev B	Computer Engineering
Eraslan, Mesut	Ünlü, M Selim	Electrical Engineering
Georgescu, Ramona	Paiella, Roberto	Electrical Engineering
Ghosh, Soma	Alanyali, Murat	Computer Engineering
Goode, Darryl	Teich, Malvin C	Electrical Engineering
Griffis, Karin	Bystrom, Maja E	Systems Engineering
Gu, Yongfeng	Herbordt, Martin C	Computer Engineering
Gunna, Sulakshana	Bellotti, Enrico	Computer Engineering
He, Zhihua	Bystrom, Maja E	Electrical Engineering
Huang, Chien Chih	Knepper, Ronald W	Electrical Engineering
Hunt, Stephen	Oliver Jr, William L	Electrical Engineering
Ince, Serdar	Konrad, Janusz	Electrical Engineering
Jastrzebski, Piotr	Lee, Min-Chang	Electrical Engineering
Jenkins, Karen	Castañón, David A	Electrical Engineering

Student Name	Advisor	Research Area or Thesis Title
Jeong, Jonghoon	Levitin, Lev B	Electrical Engineering
Huang, Chien Chih	Knepper, Ronald W	Electrical Engineering
Ince, Serdar	Konrad, Janusz	Electrical Engineering
Jastrzebski, Piotr	Lee, Min-Chang	Electrical Engineering
Jenkins, Karen	Castañón, David A	Electrical Engineering
Jeong, Jonghoon	Levitin, Lev B	Electrical Engineering
Jones, Lawrence W	Levitin, Lev B	Computer Engineering
Karl, Christian	Hubbard, Allyn E	Electrical Engineering
Kaur, Parminder#	Trachtenberg, Ari	Computer Engineering
Ke, Wang	Little, Thomas D C	Electrical Engineering
Keene, Sam	Carruthers, Jeffrey B	Electrical Engineering
Kim, Duk Joong	Hubbard, Allyn E	Electrical Engineering
Kulikowski, Konrad	Karpovsky, Mark	Computer Engineering
Kunapareddy, Nagapratima	Bigio, Irving J	Electrical Engineering
Laifenfeld, Moshe	Trachtenberg, Ari	Electrical Engineering
Laurent, Sophie*	Mendillo, Michael	Design of a High Definition Imaging (HDI) Analysis Technique Adapted to Challenging Environments
Li, Ning	Morse, Theodore	Electrical Engineering
Li, Xiaojun*	Morse, Theodore	Polarization Switching High Power Fiber Laser
Li, Yan	Paiella, Roberto	Electrical Engineering
Li, Wei	Moustakas, Theodore	Electrical Engineering
Litvin, Andrey	Karl, William C	Electrical Engineering
Liu, Chenhui	Levitin, Lev B	Computer Engineering
Lu, Shan	Hubbard, Allyn E	Computer Engineering
Martin, Benjamin#	Castañón, David A	Electrical Engineering
Mathur, Raman	Karpovsky, Mark	Electrical Engineering
Miao, Lei	Cassandras, Christos G	Electrical Engineering
Mustafa, Mehmet	Karpovsky, Mark	Computer Engineering
Nasr, Magued*	Saleh, Bahaa	Quantum Optical Coherence Tomography
Nintanavongsa, Prusayon	Levitin, Lev B	Computer Engineering
Nourzad, Marianne	Hubbard, Allyn E	Computer Engineering
Ntaikos, Dimitrios	Carruthers, Jeffrey B	Electrical Engineering
Ozkumur, Ismail	Ünlü, M Selim	Electrical Engineering
Pavlovich, Julia	Karl, William C	Electrical Engineering
Petrova, Mariya	Karl, William C	Electrical Engineering
Polimeni, Jonathan	Schwartz, Eric L	Electrical Engineering
Ray, Saikat*	Oliver Jr, William L	Global Effects of Local Transmission Strategies in Multihop Wireless Networks
Rentz, Julia	Ünlü, M Selim	Electrical Engineering
Ristivojevic, Mirko	Konrad, Janusz	Electrical Engineering
Rodriguez, Eladio	Castañón, David A	Electrical Engineering
Rykalova, Yelena	Levitin, Lev B	Computer Engineering
Savas, Onur	Alanyali, Murat	Electrical Engineering
Shagam, Michael	Paiella, Roberto	Electrical Engineering
Sharma, Abhishek	Alanyali, Murat	Computer Engineering
Shi, Yonggang*	Karl, William C	Dynamic Imaging With Fast Level Set Methods
Smirnov, Alexandre	Taubin, Alexander	Computer Engineering
Spasov, Dejan	Trachtenberg, Ari	Electrical Engineering
Srivastava, Rashmi	Nawab, Syed Hamid	Computer Engineering
Stern, Alvin Gabriel	Moustakas, Theodore	Electrical Engineering
Stewart, Jason	Bifano, Thomas G	Electrical Engineering
Su, Ming#	Taubin, Alexander	Computer Engineering
Thomidis, Christos	Moustakas, Theodore	Electrical Engineering
Vamivakas, Anthony	Ünlü, M Selim	Electrical Engineering
Van Court, Thomas	Herbordt, Martin C	Computer Engineering
Wang, Yang	Bellotti, Enrico	Electrical Engineering
Williams, Adrian	Moustakas, Theodore	Electrical Engineering

Student Name	Advisor	Research Area or Thesis Title
Wotiz, Robert#	Nawab, Syed Hamid	Electrical Engineering
Wu, Tao	Starobinski, David	Electrical Engineering
Wynne, Rosalind*	Morse, Theodore	Microstructured Optical Fiber Fabrication: An Integrated Parametric Approach
Xiao, Weiyao	Starobinski, David	Electrical Engineering
Xu, Tao	Moustakas, Theodore	Electrical Engineering
Yarnall, Timothy#	Teich, Malvin C	Electrical Engineering
Zettergren, Matthew	Oliver Jr, William L	Electrical Engineering
Zhai, Qingtai	Fritz, Theodore	Electrical Engineering

Received MS as part of PhD

* Received PhD in 2004/2005

4.8 Degrees Awarded

MS Degrees Awarded

Electrical Engineering	39
Computer Systems Engineering	30
Photonics	5
TOTAL	74

PhD Degrees Awarded

Electrical Engineering	10
Computer Systems Engineering	1
Systems	0
TOTAL	11

PhD Dissertations

Student Name	Dissertation Advisor	Dissertation Title
Bhattacharyya, Anirban	Moustakas, Theodore	III-Nitride Ultraviolet Emitters produced by Molecular Beam Epitaxy
Bynoe, Wayne	Carruthers, Jeffrey B	Effects of Simulcasting on the Performance of Multi-Hop Wireless Local Area Networks
Chen, Fangyi	Hubbard, Allyn	A Hydro-Mechanical Biomimetic Cochlea: Experiments and Models
Colerico, Marlene	Mendillo, Michael	Characterization and Modeling of the Upper Atmosphere's Midnight Temperature Maximum Using Ground-Based Optical Observations
Dosunmu, Olufemi	Ünlü, M Selim	High-Performance Germanium Photodetectors on Silicon Reflecting Substrates for Long-Haul Optical Communications
Laurent, Sophie	Mendillo, Michael	Design of a high definition imaging (HDI) analysis technique adapted to challenging environments
Li, Xiaojun	Morse, Ted	Polarization Switching High Power Fiber Laser
Nasr, Magued	Saleh, Bahaa	Quantum Optical Coherence Tomography
Ray, Saikat	Starobinski, David	Global Effects of Local Transmission Strategies in Multihop Wireless Networks
Shi, Yonggang	Karl, William C	Dynamic Imaging With Fast Level Set Methods
Wynne, Rosalind	Morse, Ted	Microstructured Optical Fiber Fabrication: An Integrated Parametric Approach

4.9 Graduate Teaching Fellows

Student Name	Course	Student Name	Course
Fall 2004		Spring 2005	
Borogovac, Tarik	SC415/416	Agarwal, Ashish	SC450
Butler, Thomas	SC311	Basiaga, Dariusz	Photonics Lab
Chivas, Robert	SC463/464	Borogovac, Tarik	SC415/416
Cunha, Michael	SC471	Butler, Thomas	EK307
Cvetkovski, Andrej	SC401	Chivas, Robert	Photonics Lab
Dai, Haitao	SC410	Cunha, Michael	SC463/464
Diaz, Marcos	SC455	Dai, Haitao	EK307
Georgescu, Ramona	SC330	D'Orsogna, Danilo	SC410/412
Griffis, Karin	SC441	Dutta, Madhuparna	SC463/464
Jain, Ashish	SC410	Georgescu, Ramona	EK307
Li, Xiaojun	SC560	Griffis, Karin	SC441
Li, Yan	SC410	Jain, Ashish	EK307
Menn, Stephen	SC410	Kulikowski, Konrad	SC500
Nourzad, Marianne	SC571	Nourzad, Marianne	SC571
Ozkumur, Emre	EK317	Ozkumur, Emre	EK307
Petrova, Mariya	EK307	Petrova, Mariya	EK307
Rahman, Rashedur	SC450	Rahman, Rashedur	SC401
Rao Karikurve, Sharath	SC463/464	Rao Karikurve, Sharath	SC463/464
Shagam, Michael	SC410	Ristivojevic, Mirko	SC450
Smirnov, Alexander	SC440/447	Shagam, Michael	EK440
Spasov, Dejan	SC311	Smirnov, Alexander	SC330/440
Su, Ming	SC312	Spasov, Dejan	SC311
		Su, Ming	SC312
Summer 2004			
Yan Li	EK307		
Ming Su	SC312		
Madhuparna Dutta	SC410		
Konrad Kulikowski	SC440/447		

4.10 Research Assistants

Student Name	Advisor	Student Name	Advisor
Abell, Joshua	Moustakas, Theodore	Li, Ning	Morse, Ted
Abu Ayyash, Salma	Little, Thomas	Li, Wei	Moustakas, Theodore
Aeron, Shuchin	Saligrama, Venkatesh	Li, Xiaojun	Morse, Ted
Agarwal, Sachin	Trachtenberg, Ari	Li, Yan	Paiella, Roberto
Aldridge, John	Ruane, Michael	Liang, Zhuangli (Physics)	Karl, Clem
Atia, George	Saligrama, Venkatesh	Litvin, Andrey	Karl, Clem
Azua, Tommy	Goldberg, Bennett	Lopez, Mariela	Ruane, Michael
Basiaga, Dariusz	Morse, Ted	Lu, Shan	Mountain, David
Bergstein, David	Ruane, Michael/Ünlü, Selim	Ma, Xing (AME)	Castañón, David
Bhattacharyya, Anirban	Moustakas, Theodore	Martin, Benjamin	Castañón, David
Bozinovic, Nikola	Konrad, Janusz	Mathur, Raman	O'Connor, Peter
Browning, Cassandra	Swan, Anna	Matsunaga, Keiko (MFG)	Teich, Malvin
Byrnes, John	Semeter, Joshua	Menn, Steven	Ünlü, Selim
Cabalu, Jasper	Moustakas, Theodore	Meydbray, Yevgeny	Ünlü, Selim
Carsow, Douglas	Fritz, Theodore	Miao, Lei	Cassandras, Christos
Chandrasekaran, Ramya	Moustakas, Theodore	Nasr, Magued	Saleh, Bahaa
Chang, Shey-Sheen (Sam)	Roy, Serge	Nourzad, Marianne	Hubbard, Allyn
Chen, Tai-Chao	Moustakas, Theodore	Ntaikos, Dimitrios	Fritz, Theodore
Chivas, Robert	Morse, Ted	Pavlovich, Julia	Karl, Clem
Cui, Yanhong	Horenstein, Mark	Polimeni, Jonathan	Schwartz, Eric
Cvetkovski, Andrej	Saligrama, Venkatesh	Praino, Julie	Saleh, Bahaa
Davis, Brynmor	Swan, Anna	Quesnel, Justin	Ünlü, Selim
Diaz, Marcos	Semeter, Joshua	Rao, Suyog	Benson, Gary
Dobson, Jennifer	Bigio, Irving	Ray, Saikat	Starobinski, David
Dogan, Mehmet (Physics)	Ünlü, Selim/Goldberg, Bennett	Ristivojevic, Mirko	Konrad, Janusz
D'Orsogna, Danilo	Bellotti, Enrico	Rodriguez, Eladio	Castañón, David
Dosunmu, Olufemi	Ünlü, Selim	Ruan, Dan	Castañón, David
Driscoll, Kristina	Paiella, Roberto	Savas, Onur	Alanyali, Murat
Dutta, Madhuparna	Paiella, Roberto	Sharma, Abhishek	Alanyali, Murat
Eraslan, Mesut	Ünlü, Selim	Shi, Yonggang	Karl, Clem
Ermis, Erhan	Venkatesh, Saligrama	Smirnov, Alexandre	Taubin, Alexander
France, Ryan	Moustakas, Theodore	Srivastava, Rashmi	DeLuca, Carlo
Friel, Ian (Physics)	Moustakas, Theodore	Stern, Alvin	Moustakas, Theodore
Garnier, Robert	Castañón, David	Seward, Jason	Bifano, Thomas
Gioux, Sylvain	Ünlü, Selim	Subramanian, Krishnakumar	Castañón, David
Goode, Darryl	Saleh, Bahaa/Teich, Malvin	Sumorok, Daniel	Bifano, Thomas
Gu, Yongfeng	Herbordt, Martin	Thomidis, Christos	Moustakas, Theodore
Gunna, Sulakshana	Bellotti, Enrico	Thrall, Erica (BME)	Swan, Anna
He, Zhihua	Bystrom, Maja	Vamivakas, Anthony	Swan, Anna
Huang, Chien-Chih	Ekinci, Kamil	Van Court, Thomas	Herbordt, Martin
Ince, Serdar	Konrad, Janusz	Voss, David	Fritz, Theodore
Jenkins, Karen	Castañón, David	Wang, Kai Fong	Goldberg, Bennett
Karl, Christian	Hubbard, Allyn	Wang, Yang	Bellotti, Enrico
Kaur, Parminder	O'Connor, Peter	Williams, Adrian	Moustakas, Theodore
Ke, Wang	Little, Thomas	Wotiz, Robert	DeLuca, Carlo
Kim, Duk Joong	Bifano, Thomas	Xiao, Weiyao	Starobinski, David
Kulikowski, Konrad	Karpovsky, Mark	Xu, Tao	Moustakas, Theodore
Kunapareddy, Nagapratima	Bigio, Irving	Yalcin, Ayca	Ünlü, Selim/Goldberg, Bennett
Lai, Wei (MFG)	Paschalidis, Iaonnis/ Starobinski, David	Yarnall, Timothy	Teich, Malvin
Laifenfeld, Moshe	Trachtenberg, Ari	Yi, Yan (Physics)	Ünlü, Selim/Goldberg, Bennett
Laurent, Sophie	Mendillo, Michael	Zettergren, Matthew	Oliver, William
		Zhai, Qingtai	Fritz, Theodore

4.11 Graduate Courses

Course Number and Title	Fall 04	Spring 05	Summer 05
SC500 Special Topics in ECE	Ziph-Schatzberg Kotiuga Skinner	Qin	
SC501 Dynamic Systems Theory	Dupont		
SC505 Stochastic Processes	Karl	Saligrama	
SC513 Computer Architecture	Herbordt		
SC514 Simulation	Vakili		
SC515 Digital Communication	Saligrama		
SC516 Digital Signal Processing	Nawab	Ishwar	
SC518 Software Project Management		Brackett	
SC520 Image Processing and Communication	Konrad		
SC524 Optimization Theory and Methods	Paschalidis		
SC533 Intro to Discrete Mathematics	Levitin		
SC534 Discrete Stochastic Models		Levitin	
SC541 Computer Communication Networks	Alanyali	Starobinski	
SC551 Advanced Digital Design	Taubin		
SC560 Intro to Photonics	Paiella	Saleh	
SC561 Error-Control Codes	Karpovsky		
SC563 Fiber-Optic Communication Systems		Morse	
SC568 Optical Fiber Sensors	Morse		
SC570 Lasers and Applications		Teich	
SC571 VLSI Principles and Applications	Hubbard	Hubbard	
SC575 Semiconductor Devices	Bellotti		
SC577 Solid State Devices		Paiella	
SC578 Fabrication Technology for Integrated Systems	Klepstyn		
SC579 Microelectronic Device Manufacturing		Cole	
SC580 Modern Active Circuit Design	Knepper		
SC700 Advanced Special Topics in ECE		Semeter	
SC710 Dynamic Programming and Stochastic Control		Caramanis	
SC712 Advanced Software for Computer Engineers		Skinner	
SC713 Parallel Computer Architecture		Herbordt	
SC715 Wireless Communication		Carruthers	
SC716 Advanced Digital Signal Processing		Nawab	
SC717 Image Reconstruction and Restoration		Karl	
SC719 Statistical Pattern Recognition	Castañón		
SC724 Advanced Optimization Theory and Methods		Paschalidis	
SC726 Personal Knowledge Engineering	Toffoli		
SC727 Advanced Coding Theory	Trachtenberg		
SC730 Informational-Theoretical Design of Algorithms		Levitin	
SC744 Mobile Ad hoc Networking and Computing		Little	
SC749 Interconnection Networks for Multicomputers	Karpovsky		
SC751 Design of Asynchronous Circuit and Systems		Taubin	
SC752 Theory of Computer Hardware Testing		Karpovsky	
SC757 Advanced Microprocessor Design			Montazam
SC761 Advanced Information Theory and Coding	Levitin		
SC763 Non-linear and Ultrafast Optics	Teich		
SC764 Optical Measurements		Sergienko	
SC765 Biomedical Optics and Biophotonics	Bigio		
SC770 Guided-Wave Optoelectronics		Ünlü	
SC772 VLSI Graduate Design Project		Hubbard	
SC775 VLSI Devices and Device Models		Bellotti	
SC850 Graduate Teaching Seminar	Nawab	Nawab	
SC892 Seminar: Electro-Physics	Moustakas Ünlü	Moustakas Ünlü	

4.12 Colloquia & Seminars

Date	Speaker	Title
September 10 ^c	Leyuan Shi Industrial Engineering University of Wisconsin-Madison	Recent Advances in Solution of Large-scale Optimization Problems
September 15 ^a	Venkatesh Saligrama Electrical and Computer Engineering Boston University	Network Signal Processing in Uncertain Environments
September 17 ^c	Victor Berry Sensicast Systems, Inc.	Have You Ever Wondered How to Build a Commercial Grade Wireless Sensor Network Product with a Small Team?
October 22 ^b	Bahaa Saleh Electrical and Computer Engineering Boston University	Tutorial on negative-epsilon negative-mu metamaterials, and thoughts on the fragmentation of the EE curriculum
November 5 ^c	Pablo A. Parrilo Laboratory for Information and Decision Systems Massachusetts Institute of Technology	SDP Approximations for Copositive and Completely Positive Matrices
November 10 ^c	Wendi Heinzelman Electrical and Computer Engineering University of Rochester	Cross-layer Techniques for Sensor Management in Wireless Sensor Networks
November 17 ^c	Frank J. Alexander Los Alamos National Laboratory	Accelerated Monte-Carlo Methods for Optimal State Estimation
November 19 ^b	Hamid Nawab Electrical and Computer Engineering Boston University	Challenges in the Decomposition of Electromyographic Signals
November 19 ^c	Robert Gao Mechanical and Industrial Engineering University of Massachusetts at Amherst	Sensors and Sensor Networks for the Condition Monitoring of Manufacturing Equipment and Processes
December 9 ^a	Nickolai Kukhtarev Physics Alabama A&M University	Ferroelectric and Photorefractive Materials for Imaging and Sensing
December 13 ^a	Sos Agaian Electrical Engineering University of Texas at San Antonio	Steganography and Steganalysis: An Overview of Research and Challenges
December 15 ^a	Gene Itkis Computer Science Boston University	Self-Protecting Cryptography
January 11 ^c	CISE Graduate Students Organized by Brenda Zhuang	First Annual (pilot) CISE Student Workshop
January 21 ^c	Georgia Parakis Operations Research Center and Sloan School of Management Massachusetts Institute of Technology	The "Price of Anarchy" and its Applications
January 28 ^b	Tommaso Toffoli Electrical and Computer Engineering Boston University	A Feast of Programmable Matter

January 28 ^c	Gad Allon Graduate School of Business Columbia University	Competition in Service Industries
January 28 ^c	Peter B. Luh Communications and Information Technologies University of Connecticut	A Lagrangian Relaxation Based Approach to Schedule Asset Overhaul and Repair Services
January 28 ^c	Mike Veatch Gordon College	Approximate Dynamic Programming for Networks
February 2 ^a	Lukas M. Eng Institute of Applied Photophysics Dresden University of Technology, Germany	Surface Plasmon-Optics from 2 to 0 Dimensions: From Stimulated Plasmon Emission to Scattering Near-Field Optics in Optically Anisotropic Samples
February 7 ^a	Vadim Backman Biomedical Engineering Northwestern University	Understanding early events in colon carcinogenesis by means of coherent backscattering of light
February 14 ^a	Mehmet Fatih Yanik Stanford University	Nano and bio-photonics: on-chip quantum coherent photon stopping and storage, sub-micron photonic switches and integration, femtosecond laser nano-surgery and nerve regeneration
February 16 ^a	Naomi Halas Electrical and Computer Engineering Rice University	Plasmonics: Optical Nanostructures by Rational Design
February 18 ^b	Victor Yakhot Aerospace and Mechanical Engineering Boston University	An Approach to Simulating Turbulent and Rheo/Bio Fluids
February 24 ^a	Sharon M. Weiss Institute of Optics University of Rochester	Active Building Blocks for Silicon Photonics
February 25 ^b	Joshua Semeter Electrical and Computer Engineering Boston University	Electrodynamic coupling of the magnetosphere and ionosphere
February 25 ^c	Sokwoo Rhee Millennial Net, Inc.	Wireless Sensor Networks Issues and their Applications
February 28 ^c	Andreas Savvides Embedded Networks and Applications Laboratory (ENALAB) Yale University	Location Discovery Indoor Ad-Hoc Sensor Networks: Platforms and Services
March 14 ^a	Raffaello D'Andrea Cornell University	Challenges and opportunities in distributed, autonomous systems
March 15 ^a	Kerry Vahala California Institute of Technology	Q>100 million micro-resonators on silicon and applications
March 16 ^a	Lin Zhong Princeton University	Energy-efficient Mobile System Design: The User's Perspective
March 17 ^a	Peter B. Catrysse E.L. Gintzon Laboratory Electrical Engineering Stanford University	Subwavelength Metal Optics in Deep Submicron CMOS Technology

Graduate Programs

March 18 ^c	Andrew Odlyzko Digital Technology Center University of Minnesota	Victorian railroads, scholarly communications, and the future of e-commerce
March 18 ^c	Laurent Massoulié Microsoft Corporation	Network Epidemics
March 21 ^a	Leonid Levin BU Computer Science Department	Randomness and Non-determinism
March 23 ^a	Alexander Sprinston California Institute of Technology	Novel Approaches to Data Distribution in Large-Scale Networks
March 25 ^a	Masoud Sharif California Institute of Technology	Fading Broadcast Channels: Challenges and Results
March 28 ^a	David Brooks Computer Science Harvard University	Pushing the bounds of low-power computing: An event-driven architecture for sensor network applications
March 29 ^a	Curt Schurgers Electrical and Computer Engineering University of California, San Diego	Energy-Efficient Wireless Networking for Embedded Systems
March 30 ^c	Vahid Tarokh Electrical Engineering Harvard University	Collaboration, Competition and Cognitive Radio Transmission In Wireless Networks: From Theory to Implementation
March 31 ^a	Jose Costa University of Michigan	Random Graphs for Structure Discovery in High-Dimensional Data
April 1 ^c	Andrea Goldsmith Electrical Engineering Stanford University	Cross-layer design of wireless ad-hoc networks: is it better to be robust, quick, or responsive?
April 4 ^a	Peter A. Beerel Electrical Engineering Systems University of Southern California	High-Speed Asynchronous Standard-Cell Design using Single-Track Full Buffers
April 5 ^a	Marco Fanciulli National Laboratory for Materials and Devices for Microelectronics Italian Institute for the Physics of Matter	High-k dielectrics for nanoelectronics and spintronics
April 6 ^a	John Frangioni Beth Israel Deaconess Medical Center/ Harvard Institutes of Medicine	Near-Infrared Fluorescent Contrast Agents and Imaging Systems for Intraoperative
April 8 ^c	Spyros Vassilaras Athens Information Technology	Cooperation Reinforcement in Wireless Mesh Networks with Centralized Supervision
April 11 ^a	Gerhard Kramer Bell Laboratories Lucent Technologies	Models and Theory for Relay Channels with Transmit and Receive Constraints
April 14 ^a	Aaron Wagner University of California, Berkeley	The Information Theory of Sleeping Sensors and Idle Servers
April 15 ^c	Vijay Subramanian Motorola Corporation	Convergence and Optimality of Opportunistic Scheduling Algorithms

April 15 ^a	Andreas Savvides Embedded Networks and Applications Laboratory (ENALAB) Yale University	Self-Configuration Services and Application Support Constructs in Wireless Sensor Networks
April 20 ^a	Jonathan Yedidia MERL Laboratories	Understanding Belief Propagation
April 22 ^c	Michael Fu Robert H. Smith School of Business Institute for Systems Research University of Maryland	Model Reference Adaptive Search: A New Approach to Global Optimization
April 27 ^a	David Soane NanoTex, Alnis BioSciences, Innovative Construction and Building Materials, DuraFizz, and Cosmetics	Novel Applications of Nanotechnology in Mature Industries
April 28 ^a	Venugopal Veeravalli National Science Foundation University of Illinois at Urbana- Champaign	Capacity of MIMO Wireless Channels via Virtual Representation
April 29 ^c	Azer Bestavros BU Computer Science Department	Exploiting the Transients of Adaptation for RoQ Attacks on Internet Resources
May 3 ^a	Luca Dal Negro Massachusetts Institute of Technology	Silicon-based Light Emitting Nanomaterials and Photonic Structures
May 23 ^c	Xiaojun Lin School of Electrical and Computer Engineering Purdue University	Cross-Layer Design and Multi-hop Wireless Networks: A Loose-Coupling Perspective

^a *ECE Colloquium Series*

^b *Research Spotlight Seminar*

^c *CISE Seminar*

five: *Research*

5.1 Areas of Research

Electro-Physics

Coordinator: Michael Ruane

Solid-State Materials & Devices

- Bellotti
- Campbell
- Horenstein
- Humphrey
- Knepper
- Moustakas
- Skocpol

Photonics

- Bellotti
- Bigio
- Carrasco
- Goldberg
- Levitin
- Luo
- Morse
- Moustakas
- Paiella
- Ruane
- Saleh
- Sergienko
- Swan
- Teich
- Ünü

Electromagnetics & Space Physics

- Felsen
- Fritz
- Giles
- Humphrey
- Kotiuga
- Lee
- Mendillo
- Oliver
- Semeter

Information Systems & Sciences

Coordinator: W. Clem Karl

Signal & Image Processing

- Bystrom
- Carruthers
- Castañón
- Ishwar
- Karl
- Konrad
- Nawab

Information & Decision Systems

- Baillieul
- Castañón
- Karl
- Saligrama

Multimedia Processing

- Bystrom
- Ishwar
- Konrad
- Little

Communications & Computer Networks

- Alanyali
- Carruthers
- Castañón
- Cassandros
- Ishwar
- Karpovsky
- Levitin
- Saligrama
- Starobinski
- Trachtenberg

Computer Engineering

Coordinator: Martin Herbordt

Software Applications

- Brackett
- Brower
- Castañón
- Giles
- Knepper
- Little
- Nawab
- Qin
- Schwartz
- Skinner
- Toffoli
- Trachtenberg

Hardware

- Herbordt
- Hubbard
- Karpovsky
- Knepper
- Qin
- Taubin
- Toffoli

5.2 Research Labs

Applied Electromagnetics Laboratory

This laboratory is devoted to problems in experimental electromagnetics with a primary focus on industrial electrostatics, sensors, and micro-electromechanical systems (MEMS). Current projects include a study of spark energies from insulating surfaces, studies of the electrostatic properties of insulating materials, development of a circular electrode array plasma-torch system, and charge-control systems for MEMS actuators. *Horenstein*

Biomedical Optics and Biophotonics Laboratory

The core theme of biomedical optics/ photonics is minimally invasive optical diagnostics and therapeutics. This laboratory focuses on the development of optics-based technologies for clinical applications and biomedical research. Current research topic areas include:

- Advanced spectroscopic technologies for tissue diagnosis
- Noninvasive measurement of drug concentrations in tissue
- Interstitial laser therapy and photodynamic therapy
- Computational methods for modeling optical transport in tissue
- Optical interferometry for imaging nerve activation. *Bigio*

Broadband Wireless Communications Laboratory

This laboratory supports research projects on the design, theory, and prototyping of broadband wireless communication systems. The major focus is on the use of infrared light as the transmission medium for high-datarate indoor wireless local-area networks. The laboratory includes facilities for the fabrication and testing of experimental prototypes as well as computing resources for system design and analysis. *Carruthers*

Computational Electronics Laboratory

The Computational Electronics Laboratory (CEL) is equipped with state-of-the-art computing tools. The lab has two computer clusters, one XP1000 Alpha Cluster (8 CPUs) running True UNIX 64, and an AMD Athalon MP Cluster (13 CPUs) running Linux. The lab also operates a variety of high performance PCs and printers. The Computational Electronics Group develops software to study semiconductor materials and to perform electronics



and optoelectronics device simulation. Commercial simulation packages, such as ISE Genesis and Silvaco Virtual Wafer Fab are currently employed. *Bellotti*

Computer Architecture and Automated Design Laboratory

Work focuses on experimental computer architecture, particularly on the application of emerging technology to computationally intensive application. Projects include developing design tools for application specific coprocessors, designing MPP router switches, vision computers, and the application of configurable computing to bioinformatics. *Herbordt*

Functorial Electromagnetics Laboratory

The Functorial Electromagnetic Analysis Lab considers the difficulties encountered in the finite element analysis of three-dimensional electromagnetic fields that

cannot be anticipated through experience with two-dimensional simulations. The lab has focused its efforts in the development of Whitney form techniques, homology calculations, algorithms for total magnetic scalar potentials in multiply-connected regions, helicity functional techniques, and data structures based on semi-simplicial objects. Torsion invariants of complexes and rational homotopy theory are currently being exploited in the context of direct and inverse three-dimensional problems such as impedance tomography and magnetic field synthesis. *Kotiuga*



Professor Joshua Semeter helps research assistant Marcos Diaz set up an antenna demonstration.

Imaging Science Laboratory (ISL)

Affiliated with the Boston University Center for Space Physics, the ISL applies state-of-the-art optical imaging technology to the study of the Earth, Moon, planets and comets. Activities include equipment design and fabrication, field campaigns to observing sites world-wide, and digital signal processing. *Mendillo, Semeter*

Integrated DSP Environments and Architectures Laboratory (IDEA)

This laboratory conducts research in digital signal processing and its integration into application systems. Issues of interest include DSP algorithms, knowledge-based systems, software architectures for integrated DSP, software environments for the development of integrated DSP systems, integration of numeric and symbolic processing, statistical signal processing, and multidimensional signal processing. This research is carried out in the context of many applications, ranging

from the interpretation of musical signals to the analysis of spread spectrum signals and the knowledge-based decomposition of electromyographic (EMG) signals. *Nawab*

Laboratory of Networking and Information Systems

This lab is involved in providing novel perspectives on modern networking issues, including scalability, heterogeneity, and performance. The lab is equipped with sophisticated hardware and software and promotes research into the fields of network synchronization, mobile computing, Internet traffic engineering, distributed Web caching, and coding theoretic approaches to real-time information reconciliation. *Starobinski, Trachtenberg*



Lightwave Technology Laboratory

This lab is one of the few university laboratories capable of designing, fabricating, and characterizing silica optical fibers. The research activities of this laboratory focus on new processing techniques for optical fibers and planar waveguides, high power optical fiber lasers, and a variety of optical fiber sensors. The components of this facility consist of a fabrication laboratory with three glass lathes including a new state-of-the-art Nextrom MCVD system, an optical laboratory with numerous pump lasers for fiber lasers, five isolation tables, and an 8m optical fiber draw tower, newly outfitted with Nextrom winding and control equipment. In addition, there is a CVD laboratory for studies of thin films. *Morse*

Magnetic and Optical Devices Laboratory (MODL)

Properties and applications of magnetic and magneto-optical materials have been studied in the MODL using optical, electrical, and computational methods. Micromagnetics modeling, using supercomputer facilities, has been applied to study commercial read/write heads, GMR memory devices, and nano-structured magnetic materials. A novel optical device for tag-free bio-sensing using resonant optical cavities and IR imaging has recently opened a new area of investigation for the MODL. Collaborations with the Center for Space Physics are investigating miniature magnetometers based on Giant Magneto Impedance, and developing the motor controls for the Loss Cone Imager, which will fly on the USAF DSX satellite in 2009. *Ruane, Humphrey, Semeter*

Multi-Dimensional Signal Processing (MDSP) Laboratory

The MDSP Lab conducts research in the areas of multidimensional and multiresolution signal and image processing and estimation, and geometric-based estimation. The applications that motivate this research include, but are not limited to, problems arising in automatic target detection and recognition, geophysical inverse problems (such as finding oil and analyzing the atmosphere), and medical estimation problems (such as tomography and MRI). The general goal is to develop efficient methods for the extraction of information from diverse data sources in the presence of uncertainty. The lab's approach is based on the development of statistical models for both observations, prior knowledge, and the subsequent use of these models for optimal or near-optimal processing. *Karl*

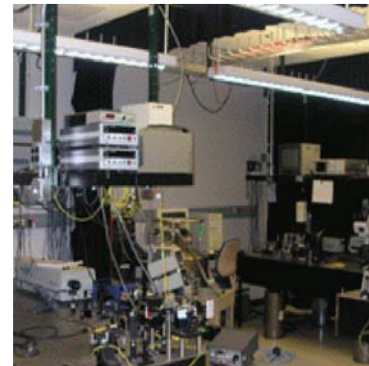
Multimedia Communications Laboratory

The focus of this laboratory is the enabling technology for distributed and multimedia applications. Research

includes investigation of distributed modes interaction among wireless computers; aggregation and clustering techniques for scaling large-scale Mobile Ad Hoc Networks (MANETs) and Sensor Networks; communication systems for continuous media; and conceptual and physical database organizations. The laboratory is equipped with a high-performance simulation environment and a wireless testbed for proof-of-concept prototype development. *Little*

Optical Characterization and Nanophotonics

Nanophotonics addresses a broad spectrum of optics on the nanometer scale covering technology and basic science. Compared to the behavior of isolated



molecules or bulk materials, the behavior of nanostructures exhibit important physical properties not necessarily predictable from observations of either individual constituents or large ensembles. We develop and apply advanced optical characterization techniques to the study of solid-state and biological phenomena at the nanoscale. Current projects include development of high-resolution subsurface imaging techniques based on numerical aperture increasing lens (NAI) for the study of semiconductor devices and circuits and spectroscopy of quantum dots; micro-resonant Raman and emission spectroscopy of individual carbon nanotubes; biosensors based on microring resonators; and development of new nanoscale microscopy techniques utilizing interference of excitation as well as emission from fluorescent molecules. In addition to microscopy, optical

resonance is nearly ubiquitous in our research projects including development of resonant cavity enhanced photodetectors and imaging biosensors for DNA and protein arrays. *Goldberg, Ünlü*

Quantum Imaging Laboratory

Research in the Quantum Imaging Laboratory focuses on photonic imaging systems that make use of the special properties of nonclassical light. Experiments are conducted on nonlinear optical parametric down-conversion; quantum coherence; quantum imaging; quantum interferometry and microscopy; and quantum communications and cryptography. *Saleh, Sergienko, Teich*

Radio Communications and Plasma Research Laboratories

Field experiments are conducted in this lab using ground-based facilities and spacecraft-borne instruments to investigate radio-wave propagation and interactions with ionospheric plasmas, with applications to establishing artificial radio communication paths. Laboratory experiments with a large, toroidal plasma device are also conducted to study the microwave interactions with magnetoplasmas, simulating and crosschecking the results obtained in the field experiments. *Lee, Semeter*

Reliable Computing Laboratory

Members of the Reliable Computing Laboratory conduct research on a broad variety of topics, including the design of computer chips; efficient hardware testing at the chip, board, and system levels; functional software testing; efficient signal processing algorithms; coding and decoding; fault-tolerant message routing for multiprocessor systems; and the design of reliable computer networks. *Karpovsky, Levitin, Roziner*

Software Engineering Laboratory (SEL)

An instructional and research lab, the Software Engineering Laboratory (SEL)

supports courses and research on the economical design of reliable software for large-scale and embedded computer based systems. The lab is comprised of more than twenty-five Silicon Graphics and Gateway 2000 networked workstations, plus four Motorola embedded computer development systems. The laboratory provides a network of workstations running Windows XP and provides students with state-of-the-art development and modeling tools for the design, implementation and testing of distributed software systems. *Brackett*



Visual Information Processing (VIP) Laboratory

The VIP Laboratory provides computational and visualization infrastructure for research in the area of visual information processing. The particular topics of interest are: manipulation, compression, transmission and retrieval of visual information, whether in the form of still images, video sequences, or multimedia data. In addition to standard monoscopic (2-D) images, also stereoscopic and multiscopic (3-D) images are studied. The primary application of this research is in the next generation multimedia communications: life-like (3-D), efficient (low bit rate), reliable (error-resilient), and flexible (object-based). The VIP Laboratory is equipped with a network of state-of-the-art workstations to serve computational needs, while its visualization infrastructure includes 2-D and 3-D digital cameras and capture systems, as well as 3-D displays (shuttered and 9-view automultiscopic “Synthagram”). *Konrad*

VLSI and Neural Networks Systems (VNNS) Laboratory

The VNNS group designs, builds, and tests innovative architectures that span a wide variety of VLSI applications in electrical and biological fields. Chips designed using digital, analog, and subthreshold methodologies are realized using CMOS BiCMOS and Bipolar technologies. Applications include neural-net image processing, integrated photonic devices and parallel photonic testing, automatic partial-valued dynamic logic synthesis, single-chip large-molecule and DNA analyzers, and neural tissue interface chips. The group is equipped with a full suite of design tools and testing instrumentation for analog and digital systems. *Hubbard*

Wide Band Gap Semiconductors Laboratory

In this laboratory, we investigate the growth, fabrication and characterization of devices based on the family of III-Nitride semiconductors. The materials are grown by MBE, MOCVD, HVPE and Gas cluster Ion-beam deposition (GCIB). The current focus is in the development of Optical Devices (UV-LEDs, UV-LDs, Optical Modulators, Detectors), Electronic Devices (High Power Diodes, Transistors and Thyristors) and Electromechanical Devices (SiC/III-Nitride MEMS sensors). Materials physics issues are also addressed and the group collaborates closely with Professor Enrico Bellotti in the area of theoretical modeling, with Professor Paiella in the area of quantum cascade lasers, with Professor Karl Ludwig (Physics) in the area of materials structure, and with Professor Kevin Smith (Physics) in the area of electronic structure. *Moustakas*

5.3 Centers and Interdisciplinary Activities

Center for Computational Science

<http://satchmo.bu.edu>

The Boston University Center for Computational Science (CCS) was founded in 1990 to coordinate and promote computationally based research, to foster computational science education and to provide for the expansion of computational resources and support.

CCS provides a forum for the multidisciplinary exchange of ideas among researchers, educators and students. Regularly scheduled seminars as well as workshops and symposia are offered to highlight advances in computational science. CCS has acted to develop and facilitate the formulation of projects in computationally based research and education, working with scientists from 20 different departments and centers.

CCS works in close collaboration with the Office of Information Technology, in particular with its Scientific Computing and Visualization Group (SCV) group, in the development of resources to support computational science. The high performance computing and visualization systems at Boston University currently include IBM p690 servers with 112 processors and peak capacity approximately 600 Gflops, 64 processor IBM RS/6000 SP, The Deep Vision Display Wall, and Live: Laboratory for Immersive Virtual Environments.

The University's support of computational research has been extended to institutions throughout New England by means of the NSF funded MARINER (<http://mariner.bu.edu/>) project, a collaboration between CCS and SCV. MARINER offers education and training programs, access to state-of-the-art computing facilities and opportunities for pilot projects, Internet connectivity and industrial partnerships. Under the auspices of MARINER, CCS takes its place as a leader in developing computational applications in collaboration with regional schools and companies.

Building on MARINER, the University is extending its programs on a national scale as a partner in the National Computational Science Alliance, one of two national Partnerships for Advanced Computational Infrastructure supported by the NSF.

Center for Space Physics

<http://www.bu.edu/csp/>

The Center for Space Physics provides a focus for research and graduate training in space physics. It is a multidisciplinary center within the Graduate School of Arts and Sciences that includes faculty from the College of Engineering and the College of Arts and Sciences. The Center carries out a wide variety of research in just some of the following fields of space

physics including: space plasma physics; magnetospheric physics; ionospheric physics; atmospheric physics; and planetary and cometary atmospheric studies.

The mission of the Center is to promote and foster space physics research and to provide a central base for that research and for the teaching of space physics, especially at the graduate level. The Center seeks to fulfill this mission by creating an intellectual atmosphere conducive to research and to the exchange and exploration of new ideas. The Center organizes a seminar series in space physics as well as internal research discussion groups, and often hosts visits of scholars from the United States and abroad. Although the Center itself offers no degree program, graduate education is a major component of Center activities. Graduate students from programs in Astronomy, Applied Physics, and Engineering conduct their thesis research at the Center. The Center provides a formal link between research groups in the Colleges of Engineering and Arts and Sciences, allowing them to co-locate research students and post-doctoral associates to allow greater interaction to everyone's benefit. The Center also provides administrative support for research projects, particularly in the areas of grant management and proposal development.

Photonics Center

<http://www.bu.edu/photonics>

To help industry bridge the gap between basic research and practical application, Boston University launched the Photonics Center in 1994 with \$29 million in seed funding from the federal government. The Center is now forging true business partnerships in which companies draw on the University's exceptional expertise and resources in engineering, science, medicine, and management to build actual product prototypes and spawn a growing stream of new companies.

The Photonics Center at Boston University is a bold new model for university-industry collaboration. It has been established to work directly with investors and industrial partners to turn emerging concepts in photonics technology into commercial products. The Center is staffed and equipped to help industry partners reduce the technical and financial risk involved in developing new ideas, refining them in the laboratory, building working prototypes, and starting up companies. To date the Center has forged joint ventures with a dozen companies to develop new products in data storage, environmental monitoring, opto-electronics, and biotechnology.

In 1997, the University completed the nine-story, 235,000 square-foot Photonics Building to house this ambitious initiative. The \$85 million facility includes a full complement of state-of-the-art laboratories as well as meeting rooms, lecture halls, and an entire floor devoted to incubator space for start-up companies that complements its existing incubator at 1106 Commonwealth Avenue. Faculty affiliated with the Center



have in-depth expertise in all aspects of photonics technology, including the core areas of opto-electronics, photonic materials, data storage, imaging systems, medical applications, and sensors.

Resources available to industry partners, government, faculty, and students through the Photonics Center support development and testing of ideas and products. These resources include several research and development laboratories: Scanning Infrared Near-Field Microscopy Laboratory, Optoelectronic Device Characterization Laboratory, Femtosecond Laser Facility, Photochemical Processes Laboratory, Photonic Systems Engineering Laboratory, Liquid Crystal Display Laboratory, Quantum Imaging Laboratory, Precision Optics Laboratory, Optoelectronic Materials Laboratory, Precision Measurement Laboratory, Optoelectronic Processing Facility, Laser Measurement and Fiber Optic Sensors Laboratory, Magnetic and Optical Devices Laboratory, Near-Field Scanning Optical Microscopy Laboratory, Picosecond Spectroscopy Laboratory, and the Advanced Electronic Materials and Devices Processing Research Laboratory.

Center for Subsurface Sensing and Imaging Systems (CenSSIS)

<http://www.censsis.neu.edu>

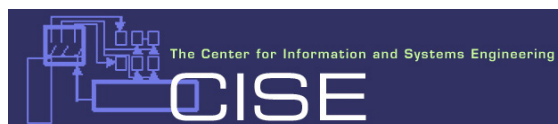
The Center for Subsurface Sensing and Imaging Systems (CenSSIS) is a National Science Foundation (NSF) Engineering Research Center (ERC), one of an elite group of only nineteen ERCs in the nation. It seeks to revolutionize the ability to detect and image objects that lie underground or underwater, or are embedded within cells, inside the human body, or within manmade structures. CenSSIS is a collaborative effort of 4 academic institutions: Boston University, Northeastern University, Rensselaer Polytechnic Institute, and the University of Puerto Rico at Mayagüez; and 4 strategic affiliates: Massachusetts General Hospital, Brigham and Women's Hospital, Lawrence Livermore National Laboratory, and the Woods Hole Oceanographic Institution. Together, the CenSSIS partnership works with industrial partners who provide their insight into research challenges.



The Center's primary focus is on detecting, locating, and identifying objects obscured beneath the covering media, such as underground plumes, tumors under the skin or developmental defects in an embryo. Utilizing electromagnetic, photonic, or acoustic probes, CenSSIS will engage biomedical and environmental problems, developing techniques for sensing subsurface conditions. Projects integrate new methods of subsurface sensing and modeling, physics-based signal processing and image-understanding algorithms, and image

and data information management methods. Research topics being addressed include: humanitarian de-mining, multilayer hyperspectral oceanography, 3-D subretinal visualization, nonlinear ultrasound medical imaging, subcellular biological imaging, electrical impedance tomography, acoustic diffraction tomography, and multi-sensor civil infrastructure assessment.

Overall, the CenSSIS program is a vehicle enabling substantial leverage of industrial investments because of the substantial level of funding available for basic research. In addition to research, the Center has established programs for education, industry collaboration, and technology transfer. An important outcome of this process is the education of students well-trained in these crucial fields for the future of public health and the preservation of the planet's physical resources.



Center for Information and Systems Engineering (CISE)

<http://www.bu.edu/systems>

The Center for Information and Systems Engineering (CISE) provides an interdepartmental home for faculty and students interested in research in information and control systems theory and its relevance to various application domains encompassing the analysis, design, and management of complex systems that have come to prominence as a result of the information, communication, and computation revolution.

Information and systems engineering research at Boston University is strong and accomplished, but it is spread across departments, colleges and schools within the University. Approved by the Trustees in 2002, with management support added in Fall 2002, CISE has raised the visibility of that strength and fostered greater interactions among researchers. As of June 2005, CISE has grown from 13 to 22 affiliated faculty from the Departments of Manufacturing Engineering, Aerospace & Mechanical Engineering, and Electrical & Computer Engineering in the College of Engineering; the Department of Computer Science, and Mathematics & Statistics in the College of Arts and Sciences; and the Department of Operations Management in the School of Management. There are approximately 60 graduate students affiliated through these faculty. CISE maintains a searchable data base of academic 'systems' publications authored by the affiliated faculty and their students.

As of November 2004, CISE launched the Sensor Network Consortium (SNC) to facilitate interactions among the academic community and industry participants who support the growth of the sensor network industry through focused research and development activities. The SNC's goals are to develop, test and accelerate adoption of sensor network related technologies in strategic applications areas; develop strategic

partnerships to access federal and regional research funding; and educate graduate students and facilitate their involvement with industry. Industry participation includes a diverse group of companies, start-ups, system integrators and adopters of sensor network technology that currently includes BP International, Ember Corporation, Echelon Corporation, Honeywell Corporation, INETCO Limited, L-3 Communications, Millennial Net Inc., Mitre Corporation, Radianse Inc., SAP, Sensicast Systems and Textron Systems.

Electrical and Computer Engineering Department faculty affiliated with CISE are Professors Alanyali, Baillieul, Carruthers, Cassandras, Castañón, Karl, Little, Saligrama, Starobinski and Trachtenberg. The application interests of their CISE related research include Automation, Robotics and Control; Communications, Networking and Information Systems; Production and Service Systems and Supply Chain Management; and Signal Processing and Pattern Recognition. Professor David Castañón is currently serving as one of the Co-Directors along with Professor Yannis Paschalidis of the department of Manufacturing Engineering. Several ECE faculty also serve on the CISE Management Committee.

Center for Remote Sensing

Center for Remote Sensing

<http://www.bu.edu/remotesensing>

The Center was established in 1986 as a facility for scientific research in the fields of archaeology, geography and geology. The Center uses satellite images and other data from airborne and ground sensors to study the Earth and its resources, particularly groundwater. This includes the monitoring of environmental changes due to both natural processes and human activities. In 1997, the Center was selected by NASA as a "Center of Excellence in Remote Sensing."

Center for Nanoscience and Nanobiotechnology

Nanobiotechnology

<http://nanoscience.bu.edu/>

Boston University formed the Center for Nanoscience and Nanobiotechnology (CNN) to advance academic and technological research and development by extending discoveries in nanoscale materials and platforms toward applications that examine and seek to understand and manipulate biological systems. The Center serves as a hub for nanoscience researchers from the Charles River and Medical Campuses and builds interdisciplinary research and training. The Center connects scientists and engineers from disparate disciplines with each other in seminars, meetings, joint visitors programs, interdisciplinary courses, industrial collaborations, and seeded projects.

CNN has three core functions: First, to develop interdisciplinary research and education in nanoscience and nanobiotechnology; second, to develop and run an industrial liaison program that partners researchers with external companies for mutual benefit; and third, to connect researchers to resources for technological commercialization. CNN and affiliated faculty are also involved in outreach activities, organizing hands-on activities, discussions, and panels around nanoscience for grade school students and working local organizations and museums.

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- Y. Yin, A.G. Walsh, S.B. Cronin, **A.K. Swan**, A. Stolyarov, **W. Bacsá**, M. Tinkham, **M.S. Ünlü**, and **B.B. Goldberg**, "Tunable resonance Raman on individual, suspended single wall carbon nanotubes." *Bulletin of APS Meeting*, March 2005.
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- V. Chauhan and **A. Trachtenberg**, "Reconciliation puzzles." *IEEE Globecom 2004*, Dallas, TX.
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- K.S. Gray, S. Menn, **M.S. Ünlü**, and M. Sahin, "Neural Stimulation with a Floating Micro-Electrode." *BMES Annual Fall Meeting*, 2004.
- O. Dosunmu, D.D. Cannon, M.K. Emsley, L.C. Kimerling, and **M.S. Ünlü**, "High-Speed Resonant Cavity Enhanced Ge Photodetectors on Si Reflecting Substrates for 1550nm Operation," *International Topical Meeting on Microwave Photonics*, p. 266-268. Ogunquit, ME, October 4-6, 2004.
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Invited Lectures:

- E. Bellotti**, "Computational Electronics of Wide Band Gap Semiconductors." Invited talk at *RPI*, Troy, NY. January 2005.
- I.J. Bigio**, "Optical Spectroscopy for the Management of Cancer Treatment." Plenary Lecture, *NIH Inter-Institute Workshop on Optical Diagnostic Imaging from Bench to Bedside*. Bethesda, MD, September 2004.
- I.J. Bigio**, "Elastic-scattering spectroscopy for cancer detection: What have we learned from preliminary clinical studies?" *OSA Annual Meeting*, Rochester, October 2004.
- I.J. Bigio**, "Optical Spectroscopy to Manage Tumor Treatment and Monitor Response." Plenary lecture, *International Conference on Tumor Progression and Therapeutic Resistance*, Philadelphia, PA, November 2004.
- I.J. Bigio**, "Monitoring of angiogenesis by the method of optical pharmacokinetics." *Colloquium: College of Engineering, Northwestern University*, December 2004.
- I.J. Bigio**, "Optical biopsy: noninvasive detection of cancer with elastic-scattering spectroscopy." Plenary lecture, *Physics of Quantum Electronics Conference*, Snowbird, UT, January 2005.

I.J. Bigio, "Optical scattering spectroscopy to noninvasively distinguish nevi." *Danbury Workshop on novel methods for melanoma*, Cold Spring Harbor Laboratory, March 2005.

I.J. Bigio, "Review of elastic scattering spectroscopy in detection of cancer." Invited expert lecture, *Rank Prize Funds Symposium on Optoelectronics in Detection of Cancer*, Lake District, England, June 2005.

M.C. Herbordt, "Opportunities for the Application of Special Purpose Computing to Protein-Ligand Docking." *Mercury Computer Corporation*, Chelmsford, MA. September 13, 2004.

J. Konrad, "Motion-compensated temporal discrete wavelet transform: To life or not to lift, that is the question." Invited lecture at *Ecole Polytechnique Federale de Lausanne*, Lausanne, Switzerland. July 5, 2004.

J. Konrad, "Motion-compensated temporal discrete wavelet transform: To lift or not to lift, that is the question." Invited lecture at *Rensselaer Polytechnic Institute*, Troy, NY. September 3, 2004.

J. Konrad, "3-D visualization and communication: Are we there yet?" Invited lecture at *Neuro Muscular Research Center, Department of Biomedical Engineering, Boston University*. October 14, 2004.

P.R. Kotiuga, "Why it is useful to have the most efficient (co)homology calculations, and useless to obsess about having the simplest cuts." *Advanced Computational Electromagnetism; Seminar on Modern Software Design, Tampere University of Technology*, Finland. August 2-4, 2004.

P.R. Kotiuga, "Computability and Tractability Issues in Topological Aspects of 3-D Computational Electromagnetics." *Algebraic Topological Methods in Computer Science II, University of Western Ontario*, London Ontario Canada. July 16-20, 2004.

P.R. Kotiuga, "How Network Analysis, Soap Bubbles, and Beer Froth help us Understand Certain 3-D Algorithms." *IEEE Student Section, Suffolk University*, Boston MA. March 29, 2005.

P.R. Kotiuga, "Euclidean Dirac Operators, Their Boundary Conditions, and Applications to Computational Electromagnetics." *Helsinki University of Technology*, Espoo, Finland. May 24, 2005.

P.R. Kotiuga, "The Eigenfunctions of the Dirichlet to Neumann Map and Applications to Electrical Impedance Tomography." *Advanced Computational Electromagnetism Seminar, Tampere University of Technology*, Finland. May 30 - June 3, 2005.

P.R. Kotiuga, "Recent Progress with Inverse Problems Involving Force-Free Magnetic Fields." *Advanced Computational Electromagnetism Seminar, Tampere University of Technology*, Finland. May 30 - June 3, 2005.

L.B. Levitin and **T. Toffoli**, "Thermodynamics cost of reversible computing." *The 1st International Workshop on Reversible Computing, RC'05, ACM Computer Frontiers, CF'05*, Ischia, Italy. May 4-6, 2005.

T.D.C. Little, "Semantic Networking of Sensor Systems for In-Network Processing." *NSF Networking of Sensor Systems (NOSS) Principal Investigator and Informational Meetings*, Golden, CO. October 18, 2004.

D. Doppalapudi, R. Milcak, J. Chan, H.L. Tuller, J. Abell, W. Li, and **T.D. Moustakas**, "Sensors based on SiC-AlN MEMS." *206th Electrochemical Society Meeting*, Honolulu, HI. October 2004.

T.D. Moustakas, "Growth of InN Films by Cluster Beam Epitaxy and RF plasma-assisted MBE." *Indium Nitride Workshop 2*, Kailua-Kona, HI. January 2005.

T.D. Moustakas, "Nitride UV-LED's based on flat and "wrinkled" quantum wells." *Photonics West 2005*, San Jose, CA. January 2005.

T.D. Moustakas, "Low-cost Blue/UV LEDs with very high Photon Conversion and Extraction Efficiency for White Lighting." *2005 DOE Solid State Lighting Program Workshop*, San Diego, CA. February 2005.

T.D. Moustakas, "MBE and HVPE Growth of III-Nitrides." *16th American Conference on Crystal Growth and Epitaxy*, Big Sky, MT. July 10-15, 2005.

R. Paiella, "Toward semiconductor intersubband optical devices at near-infrared wavelengths." *IEEE Lasers & Electro-Optics Society, Central New England Chapter*, Verizon Labs, Waltham, MA. October 2004.

W. Qin, "Description of Embedded Processors for the Synthesis of Software Tools." *EDCEP 2004*, Washington, D.C. September 25, 2004.

J. Semeter, "Causes and consequences of filamentary structure in the polar ionosphere." Presented at *Dartmouth College Plasma Physics Colloquium*. April 2005.

A.V. Sergienko, "Entanglement as a Resource for Quantum Communication and Precise Optical Measurement." *Seminar, Center for Ultracold Atoms, Harvard University*. April 12, 2005.

A.V. Sergienko, "Engineered Entanglement for Quantum Communication and Quantum Measurement." *Photonics and Optoelectronics Seminar, Massachusetts Institute of Technology*. April 6, 2005.

A.V. Sergienko, "Engineering Entangled States for Quantum Cryptography." Talk at the *Special Symposium on Practical Quantum Cryptography*, Genoa Italy. November 16, 2004.

A.V. Sergienko, "Engineering Quantum Entanglement: Creation and Applications of Optical Entanglement." *Special Seminar at Department of Physics, University Paris VI*, Paris, France. October 26, 2004.

A.V. Sergienko, "Quantum Correlation and Quantum Entanglement: Generation and Applications." Set of lectures for graduate students at the *Department of Science and Physics, University of Insubria*, Como, Italy. October - November, 2004.

D. Starobinski, "A Theory of Stability for Communication Networks." *DOE PI Meeting*, FermiLab, Chicago. September 2004

D. Starobinski, "SensorNet Architectures for Indoor Location Detection." *NSF Networking of Sensor Systems (NOSS) Meeting*. October 2004.

D. Starobinski, "On the Instability of Wireless Mesh Networks." *First Boston Area Networking and Networkers Annual Summit (BBN)*, Cambridge, MA. January 2005.

D. Starobinski, "On the Global Effects of Local Transmission Strategies in Wi-Fi Mesh Networks." Technion - Israel Institute of Technology, June 2005.

A.K. Swan, "Optical studies of individual carbon nanotubes." *Oak Ridge National Laboratory*, October 2004.

A.K. Swan, "Interference and resonance techniques in bioimaging." *Northeastern University CenCISS RICC Workshop*, October 2004.

A.K. Swan, "Environmental dependence on optical resonances in carbon nanotubes." *IBM*, May 2005.

A.K. Swan, "Environmental dependence on optical resonances in carbon nanotubes." *MIT Micro-photonics Seminar Series*, May 2005.

A.K. Swan, "Individual nanotube measurements." *NIST-NASA Workshop on Carbon Nanotube Measurement Issues*, January 2005.

A. Trachtenberg, "Robust Location Detection: Unconventional Uses for Error-Correcting Codes." *Purdue, CWSA*, March 10, 2005.

A. Trachtenberg, "Identifying codes and their cousins." *AMS, sectional*. October 24, 2004.

A. Trachtenberg, "Mathematical reconciliation of similar data." *Massachusetts Institute of Technology, LIDS*. October 12, 2004.

M.S. Ünlü, "Nanoscale Imaging of Semiconductor and Biological Systems." *University of New Mexico, LEOS Chapter*. October 2004.

M.S. Ünlü, "Nanoscale Imaging of Semiconductor and Biological Systems." *University of Kentucky, Nanoscale Engineering Certificate Program*. October 2004.

M.S. Ünlü, "Nanoscale Imaging of Semiconductor and Biological Systems." *Bogazici University*, Istanbul, Turkey. December, 2004.

M.S. Ünlü, "Nanoscale Imaging of Semiconductor and Biological Systems." *University of California, San Diego*, January 2005.

M.S. Ünlü, "Nanoscale Imaging of Semiconductor and Biological Systems." *Bilkent University*, Ankara, Turkey. January 2005.

Patents & Patent Disclosures:

I. Bigio. "Optical Measurement of Depth Profile of Topically-Applied Drugs." Fall, 2004

M. Herbordt and T. Van Court. "System and Method for Programmable Logic Acceleration of Data Processing Applications and Compiler Therefore." Application # 60/549,946.

Y. Shi and **W.C. Karl**. "A Fast Implementation of the Level Set Method." Patent Disclosure BU05-09.

B. Schapiro, **L. Levitin**, and N. Kruk. "An engine with rotating oval piston moving in an oval chamber." Patent No. 10308831, German Patent Office, September 9, 2004.

T.D. Moustakas, "Semiconductor Device having Group-III Nitride Buffer Layer and Growth Layers." September, 2004.

K.C. Toussaint, A.F. Abouraddy, **A.V. Sergienko**, **B.E.A. Saleh**, and **M.C. Teich**, "Entangled Photon Ellipsometry", U.S. Patent No. 6,822,739. November 24, 2004.

M.C. Teich, **B.E.A. Saleh**, **A.V. Sergienko**, A.F. Abouraddy, and M.B. Nasr, "Quantum Optical Coherence Tomography Data Collection Apparatus and Method for Processing Therefor." U.S. Patent Number 6,882,431, issued April 19, 2005.

Technical Reports and Other Publications:

D.K. Campbell, "Nonlinear Physics: Fresh Breather." *Nature* 432, p. 455-456. November 25, 2004.

P.R. Kotiuga, "The Idea of an Electromagnetic Field, Numerical Electromagnetism, and the Geometric Perspective." *International Compumag Society Newsletter*, vol. 12(2), July 1 2005, ISSN 1026-0854.

M.K. Hong, **A. K. Swan**, and S. Erramilli, "Evanescent wave vibrational microscopy." *Optics and Photonics News*. July 1, 2004.

Electronic Publications:

R. Brower, H. Neff and K. Orginos, "Mobius Fermions: Improved Domain Wall Chiral Fermions," hep-lat/0409118, 2004.

O. Garcia and **R. Giles**, "Research Foundations on Successful Participation of Underrepresented Minorities in Information Technology: A Cyberconference." *National Science Foundation*, 2005. <http://www.cise.nsf.gov/itminorities.html>

5.5 Grants, Contracts, and Gifts

The table on the next nine pages delineates the new grants awarded over the 2005 fiscal year. The funding level for new grants, where an ECE faculty member is the Principal Investigator (PI) is approximately \$6.4k. ECE faculty members were also Co-PIs on grants with PIs from other departments, as noted in the table. Their share of the funding for new grants awarded is approximately \$3.5k. The total of new grants is therefore approximately \$9.9k.

New Grants with ECE Principal Investigators

Recipient	Title of Award	Source	Begin Date	End Date	Amount
Alanyali, Murat; Karl, W. Clem; Saligrama, Venkatesh	Distributed Methods for Statistical Decision Making Distributed Methods for in Networked Environments (REU Supplement) (in conjunction with Center for Information and Systems Engineering)	NSF	8/1/04	7/31/07	\$12,000
Alanyali, Murat; Karl, W. Clem; Saligrama, Venkatesh	Distributed Methods for Statistical Decision Making Distributed Methods for in Networked Environments (REU Supplement) (in conjunction with Center for Information and Systems Engineering)	NSF	8/1/04	7/31/07	\$372,652
Bellotti, Enrico	Young Investigator Program: Single-Photon 3D Image Sensors	Dept. of Defense/Navy	3/15/03	4/30/06	\$95,054
Bellotti, Enrico	Photonics Technology Development and Insertion/ Task18: III-Nitride Superlattice Engineering of Vertical Transport (Photonics Center Award)	DoD/Army	5/1/05	4/30/06	\$58,020
Bellotti, Enrico	DURIP: Advanced Simulation Hardware for Imaging Devices and Materials (DURIP)	DoD/Navy	3/1/05	4/30/06	\$150,000
Bellotti, Enrico	CAREER: Theoretical Investigation of Single Photon Detectors for Quantum Technology - A Nano-Structure Devices Approach	NSF	5/1/05	4/30/10	\$400,000
Bellotti, Enrico	Numerical Simulation of Electron Beam Pumped Semiconductor UV Lasers (Subcontract via Photon Systems, Inc.)	DoD/DARPA	4/21/05	4/28/07	\$50,000
Bigio, Irving	Graduate Student Support (N. Kunapareddy) Subcontract via Los Alamos National Laboratory)	Department of Energy	6/1/05	5/31/06	\$31,642
Castañón, David	Center for Subsurface Sensing and Imaging Systems (CenSSIS) - Research Thrust 2 (Subcontract via Northeastern University)	NSF	9/1/04	8/31/05	\$294,717
Castañón, David	Cooperative Mission Control for Unmanned Air Vehicles in Complex Stochastic Environments (in conjunction with Center for Information and Systems Engineering)	DoD/Air Force	3/1/05	2/28/06	\$155,709
Castañón, David	Graduate Student Support (Krishna Subramanian)	BBNT Solutions LLC	9/1/04	5/31/05	\$20,527

Recipient	Title of Award	Source	Begin Date	End Date	Amount
Castañon, David	A Survey and Assessment of Current Automatic Target Recognition and Frame Registration Techniques for LADAR Image Processing - Graduate Student Support (R. Garnier) (Subcontract via MIT Lincoln Laboratory)	DoD/Air Force	9/1/04	12/31/04	\$13,154
Castañon, David	Graduate Student Support (Krishna Subramanian)	BBNT Solutions LLC	9/1/04	5/31/05	\$2,565
Castañon, David	Adaptive Feedback Algorithms for Sensor Management and Processing (Subcontract via BAE Systems Advanced Information Technologies Inc.)	DoD/Air Force	8/14/02	7/15/05	\$30,000
Castañon, David; Karl, W. Clem	Adaptive Feedback Algorithms for Sensor Management and Processing (Subcontract via Alphatech, Inc.)	DoD/Air Force	8/14/02	1/3/05	\$28,602
Herbordt, Martin	Exploratory/ Development Grant: FPGA-Based Computational Accelerators	HHS/NIH/NCRR	7/1/05	6/30/06	\$186,906
Karl, Christian	Foundations of Automatic Target Recognition (in conjunction with Center for Computational Science)	DoD/Air Force	9/1/03	8/31/06	\$79,566
Karl, W. Clem	Anatomic Morphologic Analysis of MR Brain Images (in conjunction with Center for Computational Science) (Subcontract via MGH)	HHS/NIH/NINDS	9/1/04	8/31/05	\$80,789
Karpovsky, Mark; Taubin, Alexander	Cryptographic Devices Resistant to Attacks	Omnibase Logic. Inc.	5/26/05	9/15/05	\$100,000
Little, Thomas; Alanyali, Murat; Kunz, Thomas; Phillips, Nathan	NeTS-NOSS: Semantic Internetworking of Sensor Systems for Efficient In-Network Information Processing (REU Supplement) (Additional co-PI: Saligrama, Venkatesh)	NSF	1/1/05	12/31/05	\$2,000
Little, Thomas; Alanyali, Murat; Kunz, Thomas; Phillips, Nathan; Saligrama, Venkatesh	NeTS - NOSS: Semantic Internetworking of Sensor Systems for Efficient In-Network Information Processing	NSF	1/1/04	12/31/04	\$250,000
Morse, Theodore	Ultra Sensitive Bio-Detection Using Whispering Gallery Spheres and Intra-Cavity Polarization Mode Beating	NSF	9/1/04	8/31/07	\$60,000
Morse, Theodore	Optical Fiber Probe for Measurement of High Temperatures (Subcontract via Hope Technologies, Inc.)	Department of Energy	7/21/03	12/31/04	\$13,000
Morse, Theodore	High Temperature Fiber Optic Sensors for Space Shuttle Tiles (Subcontract via ASE Instruments, Inc.)	NASA	11/1/04	1/31/05	\$22,500
Morse, Theodore	Specialty Fibers for Clinical Applications	DoD/Air Force	12/1/04	1/31/06	\$150,000
Moustakas, Theodore	Cluster Ion Beam Epitaxy of Ill-Nitrides	DoD/Navy	1/10/02	12/31/05	\$131,815

Research

Recipient	Title of Award	Source	Begin Date	End Date	Amount	ount
Moustakas, Theodore	MURI: Gas Cluster Ion Beam (GCIB) Epitaxy (Subcontract via Georgia Institute of Technology)	DoD/Air Force	5/1/03	5/14/06	\$131,212	
Moustakas, Theodore	Comparative Studies of UV LEDs Emitting at 280nm Grown Along Polar and Non-Polar Direction of AlN Substrates and Templates	DoD/Air Force	5/10/05	8/10/06	\$100,000	
Moustakas, Theodore	Photonics Technology Development and Insertion/Task 6: Development of GaN Substrates by HVPE to be Used by Both BU ARL Groups for Fabrication of UV-LEDs for Biological and Chemical Detection (Photonics Center Award)	DoD/Army	5/1/05	4/30/06	\$115,000	
Moustakas, Theodore	Low-Cost Blue/UV LEDs with Very High Photon Conversion and Extraction Efficiency for White Lighting	Department of Energy	9/1/04	9/30/06	\$320,000	
Moustakas, Theodore	Novel GaN HBT for Advanced T/R Modules for X-band Radar Performance Enhancement (Subcontract via Photronix, Inc.)	DoD/Air Force	9/27/04	9/29/06	\$129,475	
Moustakas, Theodore	Compact Photonics Explorers Consortium - Ultraviolet Emitters and Detectors (Subcontract via Research Foundation of City University of New York)	NASA	4/1/05	12/31/05	\$50,000	
Moustakas, Theodore	Development of Deep UV Laser Structures on to A-plane Sapphire Substrates (Subcontract via Photon Systems, Inc.)	DoD/DARPA	4/21/05	4/28/07	\$50,000	
Moustakas, Theodore; Paiella, Roberto	Photonics Technology Development and - Insertion/Task 28: III-Nitride Quantum Cascade Lasers for the 3-5um Atmospheric Window (Photonics Center Award)	DoD/ARMY	5/1/05	4/30/06	\$116,034	
Oliver, William	Incoherent Scatter Radar Studies of Hot Hot Oxygen (in conjunction with Center for Space Physics)	NSF	11/5/04	10/31/05	\$128,296	
Ruane, Michael	Center for Subsurface Sensing and Imaging Systems (CenSSIS) -- Education Program (Subcontract via Northeastern University)	NSF	9/1/04	8/31/05	\$59,537	
Ruane, Michael	Optical Sensing (J. Aldridge) (Subcontract via MIT Lincoln Laboratory)	DoD/Air Force	9/1/04	12/31/04	\$13,154	
Saleh, Bahaa	Center for Subsurface Sensing and Imaging Systems (CenSSIS) - Research Thrust 1 - Photonics (Subcontract via Northeastern University)	NSF	9/1/04	8/31/05	\$126,128	
Saleh, Bahaa; Sergienko, Alexander; Teich, Malvin	Ultrafast Quantum Optics (Subcontract via BBNT Solutions LLC)	DoD/DARPA	8/1/01	6/30/06	\$112,500	
Saleh, Bahaa; Sergienko, Alexander	Ground-Based Investigation of Upflowing Ions in the Discrete Aurora	NSF	1/1/05	12/31/05	\$79,909	

Recipient	Title of Award	Source	Begin Date	End Date	Amount
Teich, Malvin	(in conjunction with Center for Space Physics)				
Saligrama, Venkatesh	Intelligent Sensor and Relay Platforms (InSAR) (Young Investigator Program) (in conjunction with Center for Information and Systems Engineering)	DoD/Navy	5/1/02	10/31/05	\$69,598
Saligrama, Venkatesh	CAREER: A Systems Approach to Networked Decision Making in Uncertain Environments	NSF	6/1/05	5/31/06	\$80,000
Semeter, Joshua	GEM: Observational Study of Time-Dependent MI Coupling During Auroral Formation (in conjunction with Center for Space Physics)	NSF	6/1/05	5/31/06	\$79,985
Semeter, Joshua	GEM: Observation Study of Time-Dependent MI Coupling During Auroral Formation	NSF	8/1/04	5/31/05	\$67,000
Semeter, Joshua	Ground-Based Investigation of Upflowing Ions in the Discrete Aurora	NSF	8/1/04	12/31/04	\$37,000
Semeter, Joshua	Ground-Based Investigation of Upflowing Ions in the Discrete Aurora (in conjunction with Center for Space Physics)	NSF	1/1/05	12/31/05	\$60,000
Sergienko, Alexander; Saleh, Bahaa; Teich, Malvin	Ultrafast Quantum Optics (Amendment 9) (Subcontract via BBNT Solutions LLC)	DoD/DARPA	8/1/01	8/30/05	\$148,044
Sergienko, Alexander; Saleh, Bahaa; Teich, Malvin	Ultrafast Quantum Optics (Amendments 7 & 8) (Subcontract via BBNT Solutions, LLC)	DoD/DARPA	8/1/01	3/30/05	\$296,084
Sergienko, Alexander; Saleh, Bahaa; Teich, Malvin	Quantum Imaging: New Methods and Applications (MURI) (Subcontract via University of Rochester)	DoD/Army	5/1/05	9/30/05	\$143,155
Starobinski, David	A Theory of Stability for Communication Networks (in conjunction with Center for Information and Systems Engineering)	Department of Energy	8/15/04	8/14/05	\$99,999
Starobinski, David; Paschalidis, Ioannis; Trachtenberg, Ari	NeTS-NOSS: SensorNet Architectures for Indoor Location Detection - From Resolution for Robustness (REU Supplement)	NSF	9/1/04	8/31/07	\$12,000
Starobinski, David; Paschalidis, Ioannis; Trachtenberg, Ari	NeTS-NOSS: SensorNet Architectures for Indoor Location Detection - Resolution to Robustness (in conjunction with Center for Information and Systems Engineering)	NSF	9/1/04	8/31/07	\$600,000
Swan, Anna	4 Schools for WIE (Subcontract via Northeastern University)	NSF	12/15/02	11/30/05	\$52,921
Teich, Malvin	Free Space Quantum Key Distribution (T. Yarnall) (Subcontract via MIT/Lincoln Laboratory)	DoD/Air Force	6/1/05	8/31/05	\$10,867
Teich, Malvin; Saleh, Bahaa;	Free Space Quantum key Distribution - (T. Yarnall) (Subcontract via MIT/Lincoln	DoD/Air Force	9/1/04	12/31/04	\$14,470

Research

Recipient	Title of Award	Source	Begin Date	End Date	Amount
Sergienko,	Alexander Laboratory)				
Trachtenberg, Ari	CAREER: Practical Data Synchronization - Minimizing Communication	NSF	2/1/02	1/31/06	\$73,039
Ünlü, M. Selim; Goldberg, Bennett; Ekinci, Kamil; Mohanty, Pritiraj	NIRT: Advanced Characterization Techniques in Optics for Nanostructures (ACTION) (Additional co-PI: L. Novotny)	NSF	10/1/05	9/30/06	\$37,500
Ünlü, Selim	MURI: New Instrumentation for Nanoscale Subsurface Spectroscopy and Tomography (Subcontract via University of Rochester) (see source #8281-5)	DoD/Air Force	6/15/03	1/14/06	\$98,294
Ünlü, Selim	Instrumentation for Optical Sub-Systems for In Vivo Cancer Imaging (Subcontract via Beth Israel Deaconess Medical Center)	HHS/NIH/NCI	1/1/05	8/31/05	\$20,535
Ünlü, Selim	U.S. Turkey Workshop on Nanophotonics and Nanobiotechnology	NSF	3/1/05	2/28/06	\$34,980
Ünlü, Selim	Instrumentation for Optical Sub-Systems for In Vivo Cancer Imaging (Subcontract via Beth Israel Deaconess Medical Center)	HHS/NIH/NCI	9/1/04	12/31/04	\$10,263
Ünlü, Selim; Bellotti, Enrico	Device Characterization to Support Strain - Balanced InAsSb MWIR Avalanche Photodiodes (Subcontract via Spire Corporation)	DoD/Air Force	10/1/04	7/29/05	\$30,000
Subtotal	Grants with ECE PIs				\$6,408,197.00

New Grants with ECE co-PIs

Recipient	Title of Award	Source	Begin Date	End Date	Amount
Campbell, David; Erskine, Mary; Horenstein, Mark	No Longer a Dream Deferred: Greater Minority STEM Participation Through Academic and Institutional Change (Subcontract via UMASS/Amherst)(\$86,000.00)	NSF	3/1/05	2/8/06	\$57,333
Campbell, David; Erskine, Mary; Horenstein, Mark	No Longer a Dream Deferred: Greater Minority STEM Participation Through Academic and Institutional Change - Participant Support Cost (Subcontract via UMASS/ Amherst) (\$46,100.00)	NSF	3/1/05	2/28/06	\$30,733
Garik, Peter; Goldberg, Bennett; Ruane, Michael; Phillips, Constance	GK-12: Project STAMP - Science Technology and Mathematics Partnerships (additional co-PI: Donald DeRosa) (in conjunction with Science and Math Education Center) (\$471,245.00)	NSF	6/1/05	5/31/06	\$117,811
Giles, Roscoe	Collaborative Research: EPIC- Engaging People in Cyberinfrastructure (\$1,500,000.00)	NSF	3/1/05	6/30/06	\$1,500,000

Recipient	Title of Award	Source	Begin Date	End Date	Amount
Giles, Roscoe	ITR/EWF: New Approaches to Human Human Capital Development Through Information Technology Research (Subcontract via Portland State University) (\$105,801.00)	NSF	9/1/04	8/31/05	\$105,801
Goldberg, Bennett; Swan, Anna; Ünlü, M. Selim; Karl, W. Clem	Nanoscale Imaging of Subcellular Processes (in conjunction with Photonics Center) (\$348,400.00)	HHS/NIH/NIBIB	7/1/05	6/30/06	\$261,300
Lane, Kenneth; Rebbi Claudio; Pi, So-Young; Cohen, Andrew	Active Filtering in the Cochlea (in conjunction with Hearing Research Center) (Additional co-PI: Richard Brower) (\$480,777.00)	HHS/NIH/NIDCD	7/1/04	6/30/05	\$240,389
Lane, Kenneth; Rebbi Claudio; Pi, So-Young; Cohen, Andrew	EarLab: A Virtual Hearing Laboratory (in conjunction with Hearing Research Center) (Additional co-PI: Richard Brower) (\$475,877.00)	HHS/NIH/NIDCD	9/1/04	8/31/05	\$237,939
Mountain, David; Hubbard, Allyn; Oberai, Assad	Models of Beaked Whale Hearing and Responses to Underwater Noise (in conjunction with Hearing Research Center) (\$25,000.00)	DoD/Navy	4/6/04	7/5/06	\$8,333
Mountain, David; Hubbard, Allyn; Oberai, Assad	Models of Beaked Whale Hearing and Responses to Underwater Noise (in conjunction with Hearing Research Center) (\$85,414.00)	DoD/Navy	4/6/04	7/5/06	\$28,471
Mountain, David; Hubbard, Allyn;	Models of Beaked Whale Hearing and Responses to Underwater Noise (in conjunction with Hearing Research Center) (\$494,376.00)	DoD/Navy	7/1/05	6/30/06	\$247,188
Mountain, David; Hubbard, Allyn	Models of Beaked Whale Hearing and Responses to Underwater Noise (in conjunction with Hearing Research Center) (\$67,620.00)	DoD/Navy	4/7/04	7/5/06	\$22,540
Mountain, David; Hubbard, Allyn	Models of Beaked Whale Hearing and Responses to Underwater Noise (in conjunction with Hearing Research Center) (\$40,000)	DoD/Navy	4/7/04	7/5/06	\$13,333
Mountain, David; Hubbard, Allyn; Oberai, Assad	ITR-(ASE)-(sum): Optimized Dirac Inverter for Quantum Field Theory (\$100,000.00)	NSF	9/15/04	8/31/05	\$50,000
Mountain, David; Hubbard, Allyn; Oberai, Assad	National Computational Infrastructure for Lattice Gauge Theory (\$168,863)	Dept. of Energy	7/15/05	7/14/06	\$84,432
Rebbi, Claudio; Brower, Richard	Research in Particle Physics/Task E: Theoretical Particle Physics (\$500,000)	Dept. of Energy	2/1/05	1/31/06	\$100,000
Rebbi, Claudio; Bresnahan, Glenn; Giles, Roscoe; Porter, John	Research in Particle Physics/Task E: Theoretical Particle Physics (\$33,000)	Dept. of Energy	2/1/04	1/31/05	\$6,600

Research

Recipient	Title of Award	Source	Begin Date	End Date	Amount
Rebbi, Claudio; Brower, Richard	MRI- Acquisition of Blue Gene/L Supercomputer for Computational Science Research (\$800,000.00)	NSF	3/15/05	2/29/08	\$200,000
Rebbi, Claudio; Brower, Richard	National Computational Infrastructure for Lattice Gauge Theory (\$204,861)	Dept. of Energy	7/15/04	7/14/05	\$102,431
Rebbi, Claudio; Caraminis, Michael; Coker, David; Giles, Roscoe	IGERT: Multidisciplinary Approach to the Integration of High-Performance Computing in Science Education (\$536,780.00)	NSF	12/1/04	11/30/05	\$134,195
Subtotal	Grants with ECE co-PIs				\$3,508,957.00
Grand Total					\$9,917,154.00

Continuing Grants and Contracts, FY05

Recipient	Title of Award	Source	Begin Date	End Date
Alanyali, Murat 8276-5	CAREER: Scalable Architectures for Self-Managed Networks (in conjunction with Center for Information and Systems Engineering)	NSF	7/1/03	7/31/08
Bigio, Irving 8200-5	Graduate Student Support (N. Kunapareddy) (Subcontract via Los Alamos National Laboratory)	Department of Energy	6/2/07	6/1/08
Bystrom, Maja 8130-5	CAREER: Research and Education in Video Coding and Wireless Communications	NSF	9/1/02	7/31/04
Bystrom, Maja 8166-5	CAREER: Research and Education in Video Coding and Wireless Communications (REU Supplement)	NSF	9/1/02	7/31/04
Castañón, David; Saligrama, Venkatesh 8358-5	Dynamic Replanning and Multi-Vehicle Control for Intelligent Unmanned Vehicles (in conjunction with Center for Information and Systems Engineering) (Subcontract via ALPHATECH, Inc.)	Department of Defense/Navy	8/1/03	1/31/06
Karl, W. Clem 8348-5	Anatomic Morphologic Analysis of MR Brain Images (in conjunction with Center for Computational Science (Subcontract via MGH)	HHS/NIH/NINDS	9/1/03	8/31/04
Konrad, Janusz; Karl, W. Clem 8056-5	US - France Cooperative Research: Segmentation and Reconstruction of Scenes with Dynamic Objects	NSF	5/1/03	4/30/06
Konrad, Janusz 4991-5	Joint Space-Time Analysis and Characterization of Image Sequences	NSF	7/1/04	6/30/05
Morse, Theodore 8034-5	Optical Fiber Fabrication (Subcontract via Optoelectronics Industry Development Association)	Department of Commerce/NIST Department of	11/26/02	1/31/03

Recipient	Title of Award	Source	Begin Date	End Date
Morse, Theodore 1920-6	ONR HBCU Future Engineering Faculty Fellowship (R. Wynne) (Subcontract via North Carolina Agricultural and Technical State University)	Defense/Navy	5/1/04	12/31/04
Morse, Theodore 4921-5	Research in Fiber Lasers	Department of Defense/Air Force	11/1/03	10/31/04
Moustakas, Theodore 8052-5	Electronic Cooler (Subcontract via Astralux, Inc.)	Department of Defense	12/1/02	10/1/04
Moustakas, Theodore 8156-5	Harsh Environment Fluid Viscosity-Density Sensor (Subcontract via Boston MicroSystems, Inc.)	NSF	4/1/03	1/31/05
Moustakas, Theodore 8368-5	Ultraviolet Emitters and Detectors (Subcontract via Research Foundation of CUNY)	NASA	9/2/07	10/01/08
Moustakas, Theodore 8487-5	Deep Ultraviolet Laser Diode for UV-Resonance Enhanced Raman Identification of Biological Agents (Subcontract via Photon Systems)	Department of Defense/DARPA	2/16/08	2/16/10
Moustakas, Theodore 8500-5	Comparative Studies of UV LEDs Emitting at 280 nm Grown Along Polar and Non-Polar Direction of AlN Substrates and Templates	Department of Defense/Air Force	3/18/04	6/15/05
Sergienko, Alexander; Saleh, Bahaa; Teich, Malvin 8285-5	ITR: Integrated Source of High-Fidelity Entangled States for Quantum Information Processing	NSF	9/1/03	8/31/04
Starobinski, David 8193-5	CAREER: Quality of Service Engineering with Multiple Time-Scale Traffic (REU Supplement)	NSF	5/1/03	7/31/07
Swan, Anna; Goldberg, Bennett 8539-5	RET Supplement - Nanometer Resolution Spectral Self-Interference Fluorescence Microscopy	NSF	6/1/04	4/30/05
Swan, Anna; Goldberg, Bennett; Ünlü, M. Selim; Karl, W. Clem 8124-5	Nanometer Resolution with Spectral Self-Interference Fluorescence Microscopy (additional co-PI: C. Cantor)	NSF	1/1/03	4/30/05
Swan, Anna; Goldberg, Bennett; Ünlü, M. Selim; Karl, W. Clem 4902-5	Nanometer Resolution with Spectral Self-Interference Fluorescence Microscopy	NSF	4/1/02	4/30/05
Teich, Malvin; Saleh, Bahaa 4102-5	Functional Imaging of Synapses by Entangled-Photon Microscopy	The David and Lucille Packard Foundation	8/1/99	8/31/04

Research

Recipient	Title of Award	Source	Begin Date	End Date
Teich, Malvin; Saleh, Bahaa 4504-5	XYX on a Chip: Development and Fabrication of Three-Dimensional Microdevices (subcontract via Boston College)	NSF	9/1/01	8/31/03
Trachtenberg, Ari; Starobinski, David 8174-5	A Scalable Middleware for Data Reconciliation in PDA's and Mobile Networks	NSF	6/1/03	5/31/06
Ünlü, Selim 4915-5	U.S. - Switzerland Cooperative Research: Monolithic High-speed Photo receivers, Wavelength, and Polarization Sensors on Si	NSF	1/1/02	12/31/04
Ünlü, Selim; Goldberg, Bennett; Lutchen, Kenneth 4053-5	Development and Study of Hyper-Polarized Noble Gas System	NSF	9/1/1	8/31/04

six: Outlook

6.1 Overview

The Department of Electrical and Computer Engineering (ECE) at Boston University is a medium-size Research-I department with a current enrollment of 310 BS, 105 MS, and 102 Ph.D. students. The Department offers BS, MS and Ph.D. degree programs in Electrical Engineering (EE) and Computer Systems Engineering (CSE) and a new MS degree in Photonics. Both undergraduate programs are accredited by ABET. The Department has 40.5 FTE faculty, earning a approximately \$9.9M of new grants and contracts this year. The Departmental facilities occupy about 55,000 sq. ft. in the Photonics Building.

ECE is a multidisciplinary department, with a strong systems perspective. The faculty have been trained in electrical engineering, computer engineering, physics, mathematics, chemistry, computer science, and information systems. It encompasses three main areas of research and instruction: electrophysics (which includes photonics, solid state materials and devices, and electromagnetics), information systems and sciences (which includes signal and image processing systems, and control and communication systems), and computer systems engineering (which includes hardware, software applications, and computer and communication networks). These areas overlap and are mutually supportive. We have strong collegial ties to important Boston University centers, most notably the Photonics Center, the Center for Nanoscience & Nanobiotechnology (CNN), the Center for Information Systems and Engineering (CISE), the Center for Computational Science, the Center for Space Physics, the Center for Subsurface Sensing and Imaging Systems (CenSSIS), and the Center for Cognitive and Neural Systems. We also have strong links with several other departments at Boston University (See Fig.1). Many faculty members have strong extramural ties in larger centers, multi-university initiatives, and industry collaboratives.

Electrical engineering and computer systems engineering are fundamental technology disciplines. They address challenging research problems, support important applications, and offer strong opportunities for business development. Innovations from electrical and computer engineering define modern society and support much of the world's high-tech economy. Personal computers, cellular phones, fiber optics communications and the Internet, medical imaging systems, digital CDs and DVDs, laser materials processing, new energy sources, and modern defense systems are just a few of the many technologies arising from electrical and computer systems engineering.

Electrical engineering and computer systems engineering are also enabling disciplines. They are critical to the develop-

ment of virtually every field of science, technology, and medicine. Electronic instrumentation for measurements on scales from nanometers to light years, environmental monitoring of pollution, land use and global warming, automatic control systems for industry and transportation, data communications for people, corporations, and governments, computer modeling for economics, DNA, weather, and security, are examples of how we support broad areas of inquiry and contributions to human knowledge and welfare.

It is critically important that Boston University maintain an outstanding academic program in the disciplines of ECE. Electrical and computer systems engineering have special significance and relevance as key technologies for the 21st century, where information and systems sciences will be vital to the solution of the significant problems facing society. Other areas of the university benefit from the technologies and training we provide to research, education, and outreach. And the Massachusetts economy, especially along Route 128/193, is strongly dependent on companies and industries rooted in electrical and computer systems engineering. Even the financial services economy of Boston relies on information sciences, communications, and computer systems supported by the disciplines we address. Finally, efficient, effective intelligence and defense systems increasingly rely on electrical and computer systems engineering innovations. Systems are needed to collect data and project force in lieu of putting soldiers and military assets directly at risk.

ECE has helped the College of Engineering improve its overall visibility and reputation. We have attracted outstanding students and faculty, instituted major centers, and built our reputation in the professional community. In AY04-05, ECE enrolled 310 undergraduates, 105 MS students, and 102 Ph.D. students. ECE Ph.D. students have earned numerous Dean's Fellowships and prestigious external fellowship from NSF, DARPA, and the Gates Foundation. All of ECE junior faculty have been recognized with CAREER awards and/or ONR Young Investigator awards, and many of senior faculty are recognized world renowned figures in their fields. Funded research has increased in recent years and is now approaching \$9M annually.

The mission of the ECE Department is:

1. To educate our students to meet high standards of excellence in electrical and computer engineering in preparation for professional careers and advanced studies.
2. To create and disseminate new knowledge through basic and applied research in electrical and computer engineering.

3. To serve as a resource of electrical and computer engineering expertise at the local, regional, and national levels.

Our overall strategy for creating a prominent program in education, research, and outreach has been to focus on a few important areas of excellence that will create outstanding programs of research and innovation while contributing to a strong undergraduate learning experience and cutting edge graduate research. This will require faculty growth and continued University support for curriculum and laboratory development.

Plans for faculty growth (and replacements in response to attrition) have been motivated by the need to strengthen existing research areas to become more competitive at a national level, develop new expertise in areas of ECE to keep up with the rapidly-changing face of the profession and to play a leading role in shaping future technological advances, and respond to shifting and growing student enrollments at both the undergraduate and graduate levels. We also aim at exploiting the synergies between our existing research areas as well as links with other departments and centers at Boston

University. We expect a strong rebound in high tech over the next five years, and plan to invest wisely now to benefit from these coming opportunities. The continued excellence of our faculty and students will lead to the increased prominence desired for Boston University's ECE Department.

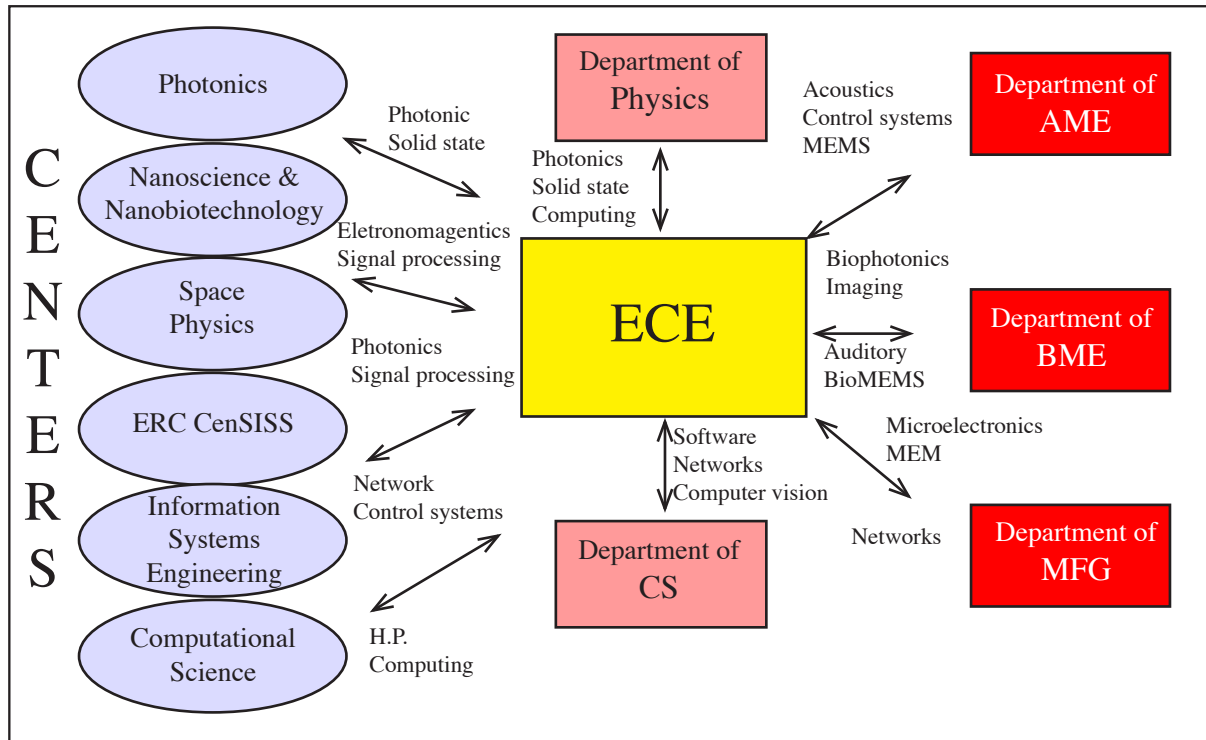


Figure 1. Links between the ECE Department and other departments and centers

6.2 History and Trends

The last decade has witnessed the maturation of the ECE department from a primarily undergraduate program to a more balanced department with high quality instruction, a larger graduate program, a substantial research program, and an increasingly distinguished faculty. In 1994, a new Department chair led an effort to expand research in a number of targeted areas and to improve the instructional programs. The relocation of the Department to the new Photonics Building in 1997 has provided faculty and students with excellent research and instructional facilities. The recent history of the Department is depicted by a number of vital statistics of enrollment, faculty size, and grant funding, as described in this section.

A. Students

Statistics of enrollment in the BS, MS, and PhD ECE programs are displayed in Fig. 2. Undergraduate enrollment has tended to mirror national patterns, including the following:

- After a period of stable undergraduate enrollment in 1996-2001, a demographic decline is occurring, as College enrollment restrictions implemented to attain a higher quality student body continue.

- While the enrollment in the EE program has remained stable in the last decade, the large increase in CSE enrollment that occurred in the late 1990's has been followed by a sharp decline (Fig. 3). For the first time in ten years, the CSE undergraduate enrollment has dropped below that of the EE program.

At the graduate level, the emphasis has shifted from professional MS-oriented students and the number of MS and PhD students are now almost equal.

- MS degree enrollment has increased in the last few years after a period of low enrollment following a sharp decline in the late 1990's due to the demise of the Corporate Classroom program.
- PhD enrollment has risen. This year, we have reached an all-time high number of 102 PhD students.
- Graduate teaching fellowship resources have remained fixed, while RA support grew with grant funding.

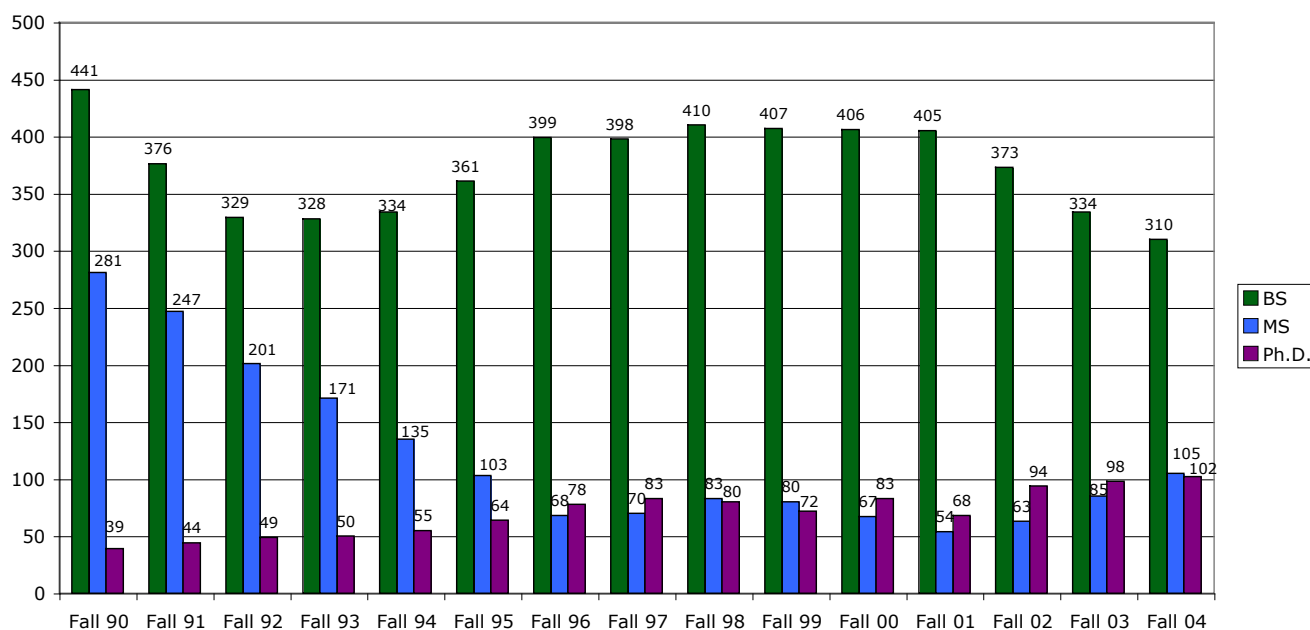


Figure 2. History of B.S., M.S. and Ph.D. student enrollment

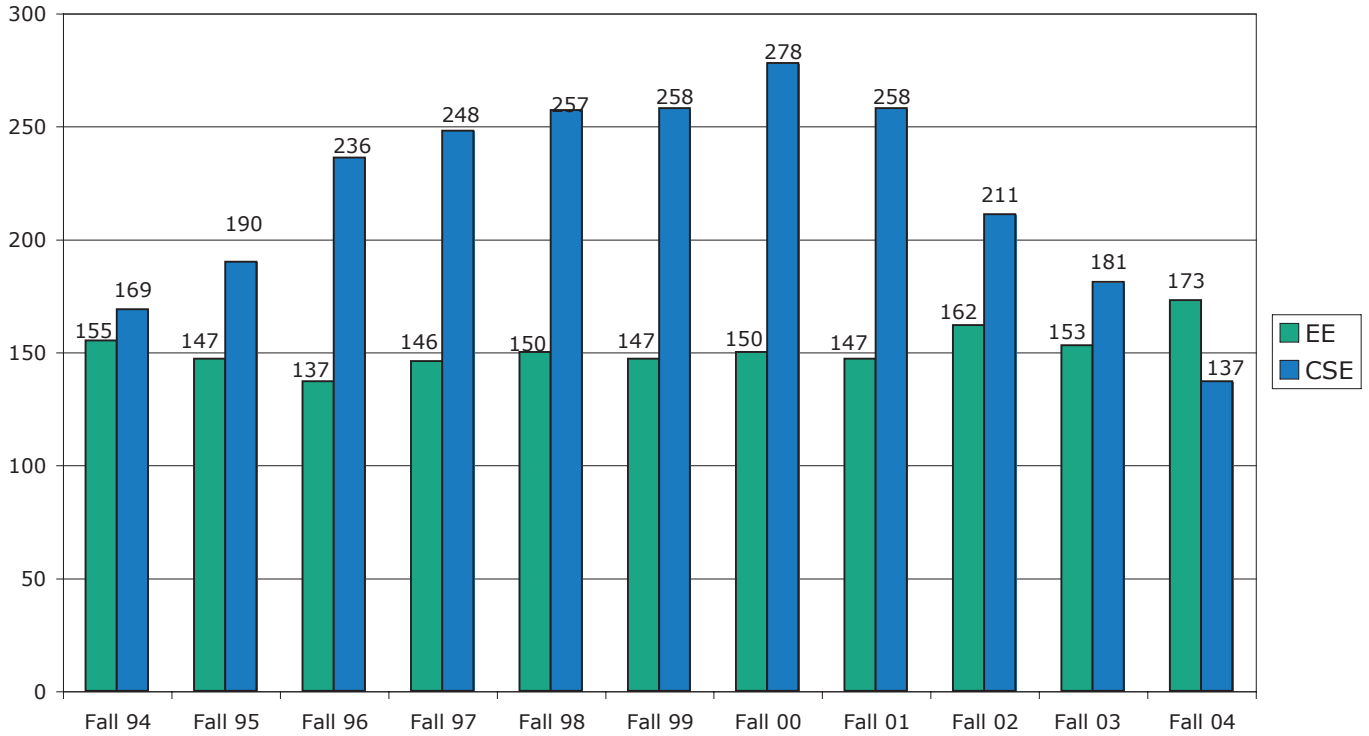


Figure 3. EE and CSE undergraduate enrollment statistics

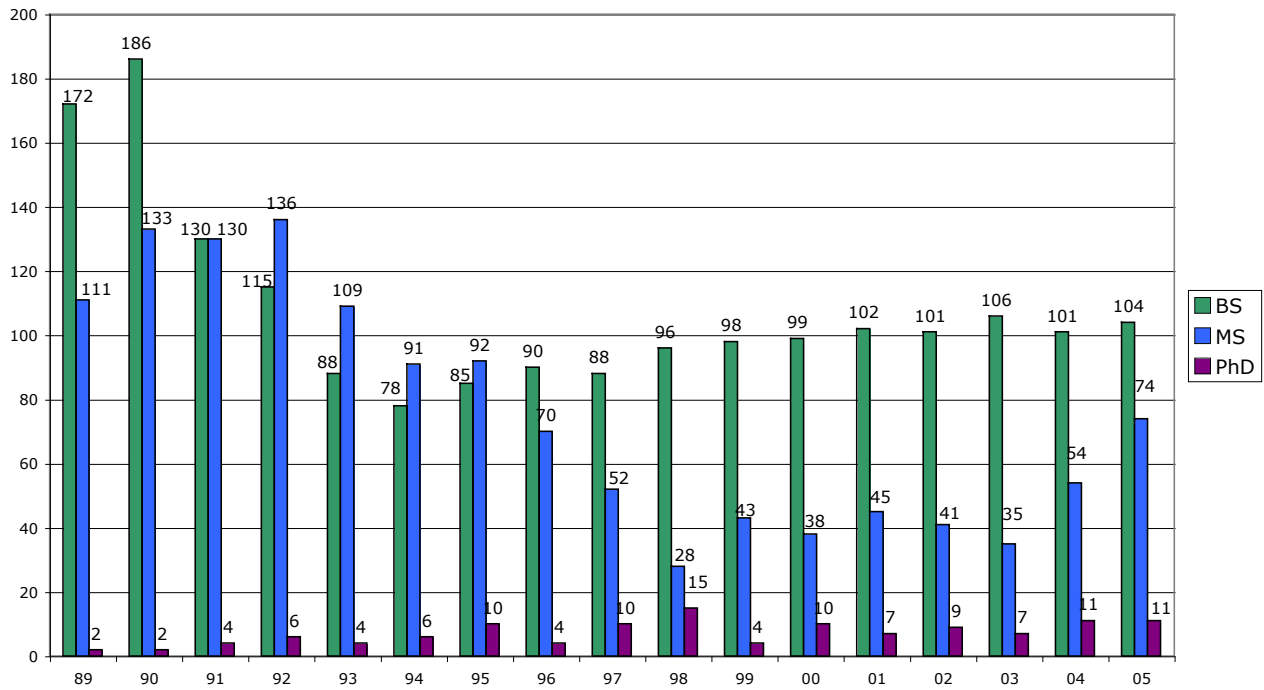


Figure 2. History of Degrees Awarded

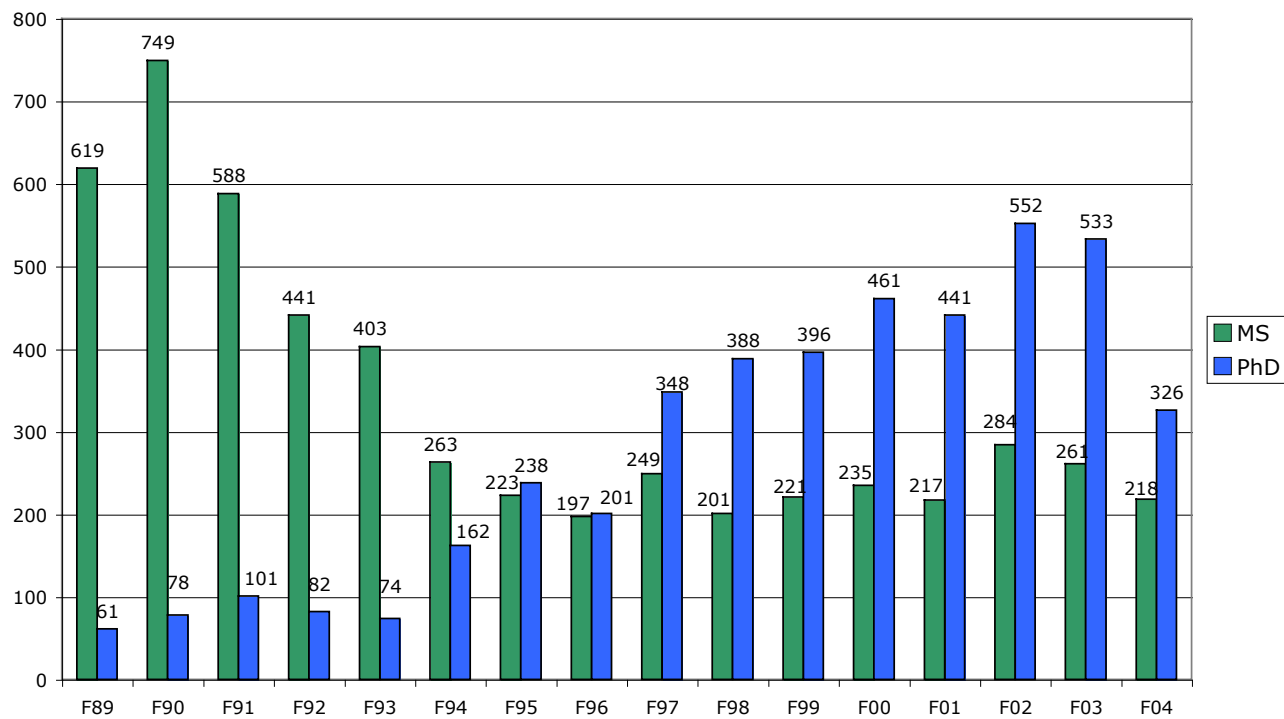


Figure 5. History of Graduate Applications

B. Faculty and Staff

Faculty hiring has largely replaced departures, with a small net growth in recent years. The appointment of three new faculty in AY04-05, and the absence of departures this year is a step in the right direction, but filling open faculty positions in key areas remains a key departmental goal. Additionally,

new faculty are needed in certain strategic areas. Previous faculty attrition has been caused by retirement, non-renewal of inactive faculty, and competition from other institutions that made attractive offers to some of our successful faculty. Proactive action to prevent such attrition is necessary.

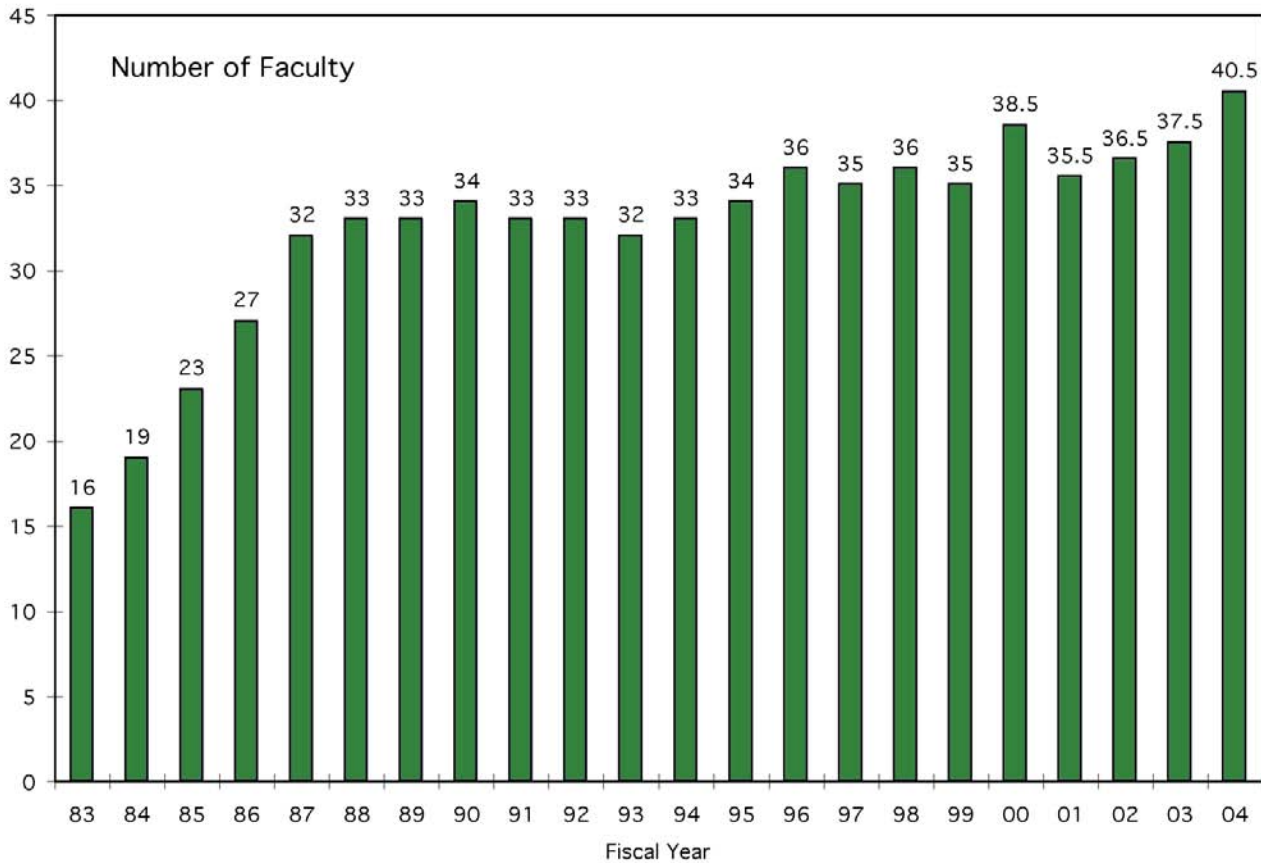


Figure 6. Number of faculty (FTE). Affiliate faculty and research faculty with no teaching responsibilities are not included in this chart. Teaching faculty without an active research program are included.

As a result of a strong emphasis on research, research funding has grown significantly in the last decade. Total annual new research funding in the last five years averaged to approximately \$7.26M, compared to \$5.2M in the 1996-00 period, and \$2.4M in 1990-95. The number of non-research-active faculty is diminishing, but still remains higher than we would like.

administrative demands, but the technical lab staff positions have remained at six. Administrative staff has grown much slower than the faculty/scientific staff head count and research volume.

Staff development has lagged behind the faculty and programmatic changes. Scientific staff (research faculty, post-docs, visiting scholars) has increased with associated space and

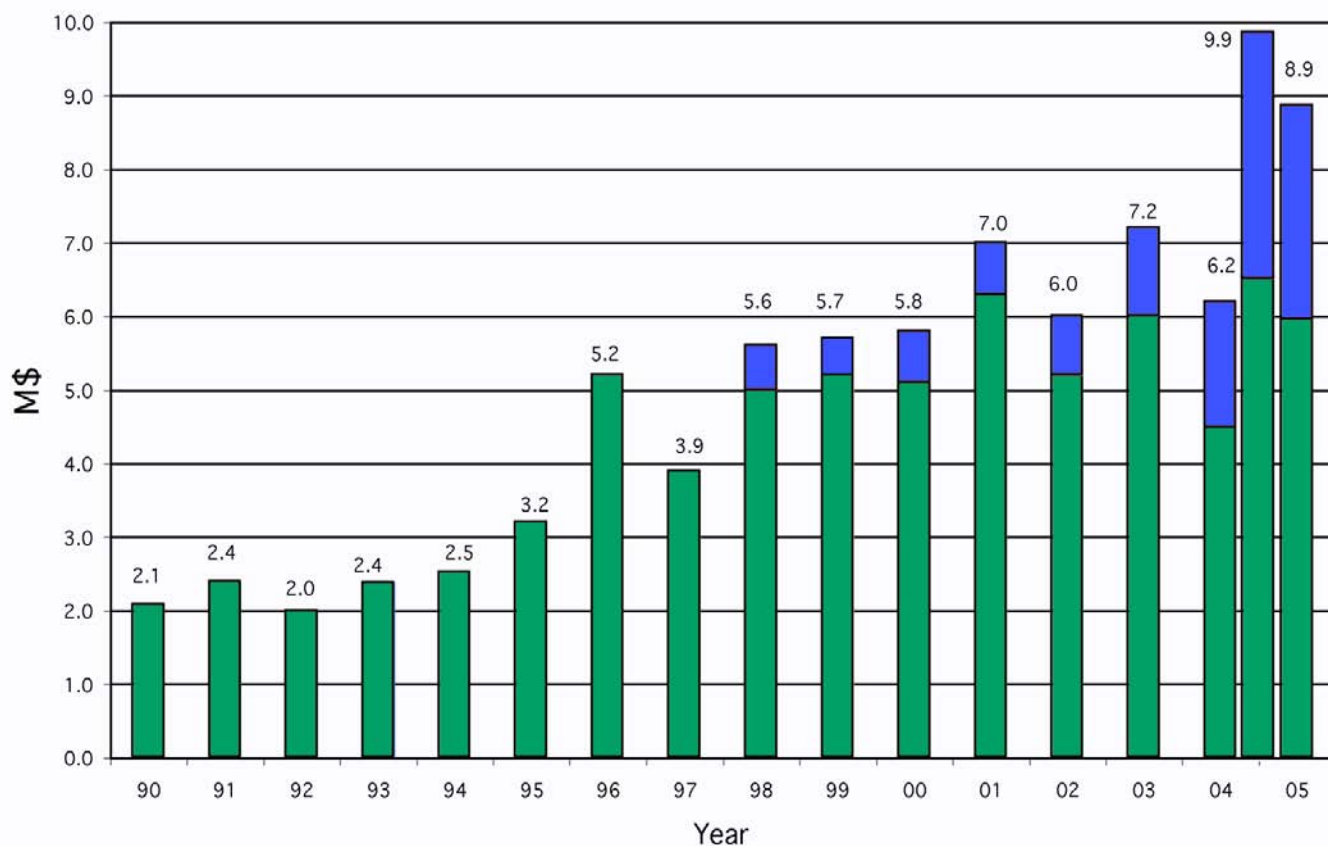


Figure 7. New research grants and contracts (the green bars represent grants and contracts for which the principal investigators were ECE faculty; the blue bars represent the share of ECE faculty in grants and contracts for which the PI are from other departments).

6.3 Areas of Research & Instruction: Needs & Targeted Growth

The ECE Department has three overlapping areas of research and instruction (see the schematic illustration in Fig. 8): Electrophysics (which includes photonics; solid state materials and devices; and electromagnetics and space physics), Information Systems & Sciences (which includes signal and image processing, and control and communication systems), and Comput-

er Systems Engineering (which includes hardware, software applications, and computer and communication networks). The following is a description of each of these areas, including its present needs and its envisioned future.

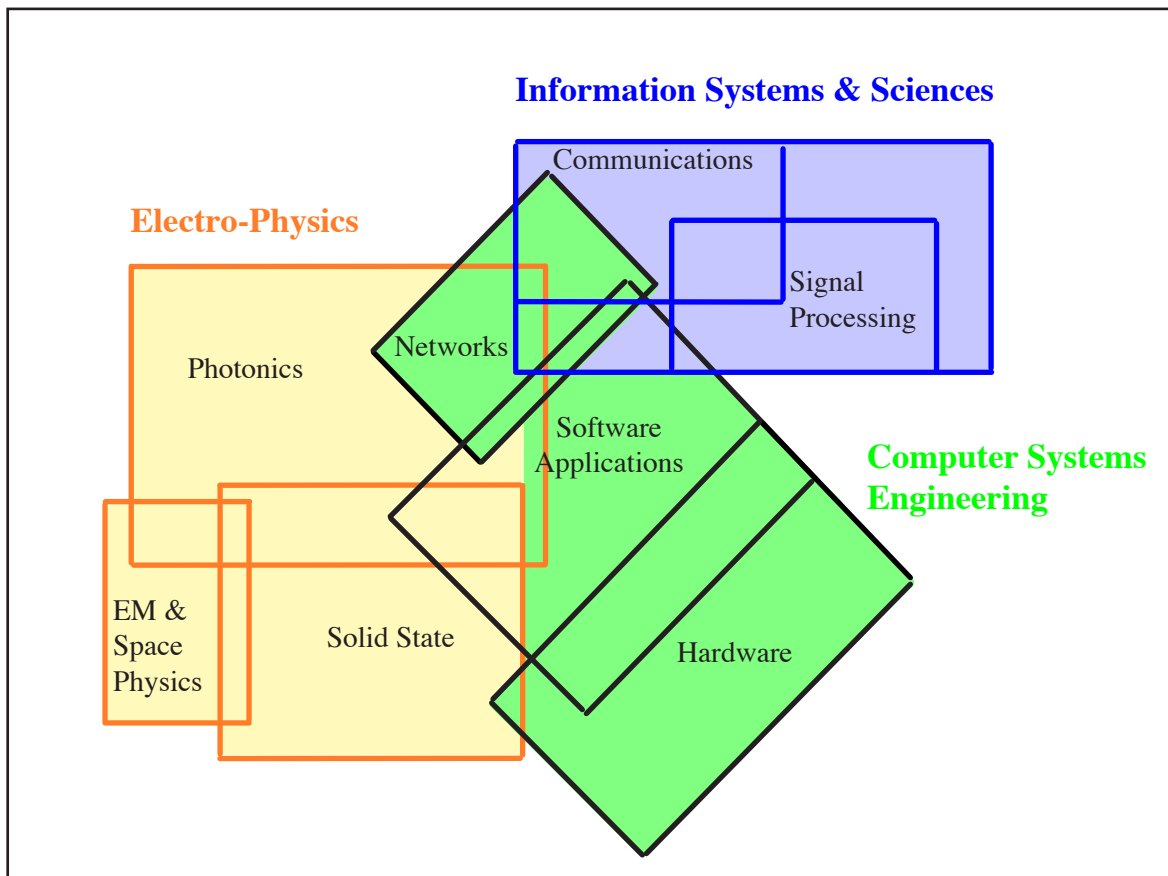


Figure 8. Areas of Research and Instruction

A. Electrophysics

Electrophysics encompasses several strong and emerging areas of electrical engineering, including photonics, solid-state materials and devices, and nanotechnology. The electrophysics faculty have strong campus collaborations in the Photonics Center, the Center for Nanoscience and Nanobiotechnology (CNN) and the Center for Space Physics, and play key

roles in the NSF Engineering Research Center (ERC) for Subsurface Sensing and Imaging Systems (CenSSIS). See Figure 1.

Photonics

When BU established the Photonics Center, it made a strategic commitment to become a national center of excellence in photonics. World-class research facilities have been developed and a number of senior and junior ECE faculty have been added. The photonics faculty have infused a large number of new courses into the curriculum, strengthening the Ph.D. program and eventually leading to the creation of the new MS in Photonics degree program. The instructional program in photonics was supported by external fellowships from the Department of Education and from curriculum development funds from industry and the National Science Foundation.

Research in photonics includes photonic materials and devices, fiber optics, quantum optics and its applications to information and communication systems, semiconductor lasers, optical imaging and microscopy, magneto-optics and optical storage, and biophotonics. Research funding in this area grew substantially in recent years, with a small fraction of the funds received through the Photonics Center. The 2000 award of Boston University's first NSF ERC, the Center for Subsurface Sensing and Imaging Systems (CenSISS), was a significant and widely publicized accomplishment that has strengthened the sensing and imaging component of photonics. The future of the BU photonics program will depend on our ability to maintain the present large momentum by filling open positions and by continuing to strengthen this program with new outstanding faculty in areas of national importance.

Solid State Materials & Devices

The solid state area includes semiconductor materials and devices and computational electronics. It overlaps naturally with photonics and we have deliberately emphasized this overlap in an effort to strengthen the photonics program while meeting our instructional needs in solid state. The most senior faculty in this area, Professor Ted Moustakas, continues to lead a large research program in the nitrides, and has had recent spectacular success in generating substantial royalty from licensed patents. Another senior faculty, Selim Ünlü, has been successful in multidisciplinary nanotechnology research, and a junior faculty, Enrico Bellotti, has received an ONR award for his solid-state numerical modeling work.

Unfortunately, the solid state area has been weakened in recent years by the departure of three key faculty members. In FY02-03, only one position was filled by an outstanding junior faculty member, Roberto Paiella, in the photonics/solid state area. The lack of an adequate number of solid state faculty has continued to make it difficult for the Department to meet the instructional needs in this area. This has also handicapped our ability to compete for large funds and to maintain expensive experimental research facilities. Continued faculty recruiting in this area is therefore necessary.

It is also of great concern that the ECE Department has lost its silicon microelectromechanical (MEMS) fabrication facility and has not yet replaced it. Further, the space that was previously allocated for this purpose in the original plans of the Photonics building has been acquired by the Photonics Center for its commercialization activities. Establishing a modest-size silicon fabrication facility and recruiting in the area of micro- and/or nanotechnology has been, and must remain, one of our highest priorities. The lab is necessary for our EE instructional program and for research in the MEMS, optical MEMS, or nanotechnology. Identified at the national level as critical to economic and security needs, nanotechnology encompasses research in areas related to photonics, biophotonics, and sensing and imaging systems, which are areas of longstanding Department interest. This is also consistent with university-wide initiatives and with our objective of maintaining a strong interest in photonic solid state materials and devices. Growth plans and recruiting in this area must therefore be well coordinated at the University level.

Electromagnetics & Space Physics

Both the electrophysics and the ISS group have maintained some collaboration with the Center for Space Physics (CSP), mainly through the efforts of ECE professors Bill Oliver and Clem Karl, and through affiliate appointments for CSP Professors Ted Fritz, Michael Mendillo, and Supriya Chakrabarti in the ECE Department. It would be highly beneficial to create a stronger link with the successful CSP programs in areas of atmospheric studies using radio wave technology, remote sensing, and astronomical imaging. The weakness of the existing link has been observed in recent evaluations of the space physics program. The recent addition of Joshua Semeter to the ECE faculty is expected to help us bridge this gap.

B. Information Systems and Sciences

The ECE Department has a strong group in information systems and sciences (ISS) with significant research in digital signal processing (Nawab), image and video processing (Castañón, Ishwar, Karl, and Konrad), optimization and control (Castañón, Saligrama), and a nascent effort in coding for communication systems (Bystrom), multimedia communication (Little, Ishwar, Saligrama), and mobile and wireless communication and sensor networks (Carruthers, Ishwar, Saligrama, Starobinski). This area overlaps with the CSE group and a program in computer networks benefits from the diverse expertise in the Department. The ISS group has established an excellent reputation and enjoys strong graduate student interest. The group has helped found the Center for Information Systems and Engineering (CISE), has been instrumental to the signal processing part of the NSF Engineering Research Center for Subsurface Sensing and Imaging Systems (CenSSIS), and has been active in the Center for Space Physics. It has recently participated in two MURI grants. Its

research in medical imaging is important to the BME Whitaker program.

This year we were fortunate to recruit Professor Prakash Ishwar who will strengthen the group in the areas of image processing, sensor networks, and multimedia-over-wireless. The continuation of recruitment of new faculty members is essential to consolidation of the program and retention of the “star” faculty members. We must seek opportunities for growth and build on our existing strengths in future hiring in areas including wavelets and filter banks, multiresolution and adaptive representation and processing, signal and image compression and coding, distributed sensing and control, collaborative communication and signal processing. Applications relating to medical imaging and space physics remote sensing are of particular interest since they exploit synergies with existing BU centers.

The ISS group is in a strong position to lead new research initiatives in Distributed Sensor Networks. This emerging technology has the potential of providing diverse services to numerous applications, including real-time early warning of toxic chemicals, biological agents, environmental pollutants, explosives, or radioactive materials for public safety and homeland security. Such “smart networks” are also envisioned to be deployed in less threatening environments: the forest, the ocean, the factory, the hospital operating room, the boardroom, or potentially the home. The ISS group has the expertise to deal with issues such as control and communication protocols, data management, access, aggregation and fusion techniques.

C. Computer Systems Engineering

Computer systems engineering has a special significance as a vital technology for the 21st century with very broad applications. This can be seen, for example, in the three national priorities outlined by the NSF – Nanotechnology, Information Technology, and Bioinformatics. Their confluence lies directly within computer systems engineering. Some opportunities include: combining nanotechnology with computing technology on a chip, development of computer systems for bioinformatics and computational biology, application of knowledge engineering to information technology and bioinformatics, and development of embedded systems for communications. The ECE Department has strengths in computer systems and architecture, VLSI systems, testing and fault-tolerant computing, coding and cryptography, high-performance computing, computer and communication networks, and wireless cellular networks.

VLSI electronics continues to be an area of fundamental importance since VLSI circuits constitute the principal hardware for computers and embedded systems. Maintaining a strong instructional program in this area is essential for both our degree programs. Application of VLSI electronics to biological sensors is an area of great potential, and interests both the

ECE and the Biomedical Engineering Departments. The addition of more faculty in this area is essential to meet increased teaching needs, to reduce the burden on research productive faculty, and to give this research area the critical mass necessary to gain national recognition and competitiveness for research funds.

Telecommunications and computer networking have dramatically changed our society and are expected to continue to have a significant economic impact and to drive much of the electronics and computer technology. The student demand for telecommunication and networking courses has been high and the Department has recently enhanced the curriculum at both the undergraduate and graduate levels. A number of new faculty have established research programs in this area, but additional faculty are necessary to reach a critical mass. The Computer Science Department at BU has also targeted computer networks as a strong research thrust, the Department of Manufacturing Engineering has a strong systems group with a related interest in discrete event systems, and the Center for Information System Engineering (CISE) has linked research activities across the departments. Our combined effort has created a strong BU program in this important area.

Research in high-performance computing is strong in ECE and is linked with the Center for Computational Science and the Scientific Computing and Visualization Center. Another link offering particularly strong synergistic possibilities with the high-performance computing group is that with the Center for Space Physics, a BU research center with strong links to ECE.

Another important area with substantial instructional needs is software engineering. Before the recent economic downturn, it was difficult to recruit qualified faculty members in this area, but this situation has now changed and timely action to address our weakness in this area is necessary.

With Prof. Wei Qin joining the ECE faculty, the position vacated by Professor John Brackett, who retired a few years ago, has finally been filled. Qin is expected to initiate a program in software development tools and embedded systems.

Pursuant to our previous strategic plan, new faculty must also be added to create real growth in CSE. This is dictated primarily by the undergraduate instructional needs and by the growing demands of graduate students for research sponsorship. Growth will also reduce the burden on the research-active faculty and give this research area the boost necessary to compete effectively for research funds and for national recognition. With targeted hires in areas such as embedded systems, hardware/software codesign, and VLSI, we will position ourselves to be among the leaders in these critical technologies, both in driving their development and in preparing students. Recruiting in CSE must be coordinated with other BU groups, particularly the Department of Computer Science to benefit from synergies and to enhance our competitiveness in attracting top-notch faculty members.

