The School of Science

DEAN: Michael A. Palladino, PhD
ASSOCIATE DEAN: Catherine N. Duckett, PhD
ASSISTANT DEAN: John A. Tiedemann, MS

Monmouth University’s School of Science is a community of teacher-scholars actively fostering learning, quantitative reasoning, and scientific inquiry among its majors and among all students. A goal of the School is to lead in the innovative development and delivery of curricula and in providing creative solutions to problems that include significant technical components. Educational programs provide a student-centered learning environment that builds a foundation for lifelong learning, critical thinking, and collaborative, technical problem solving. Faculty scholarship interests include: original basic and applied research in a range of disciplines and scholarly work on science education and pedagogy. Undergraduate and graduate students are encouraged to participate in student-faculty collaborative research projects leading to the acquisition and dissemination of new knowledge in the sciences.

The School of Science offers undergraduate degree programs in Biology, Chemistry, Clinical Laboratory Science, Computer Science, Marine and Environmental Biology and Policy, Mathematics, Medical Laboratory Science, and Software Engineering, an undergraduate Networking Technologies and Applications certificate and minors in Biology, Chemistry, Computer Science, Global Sustainability, Information Technology, Mathematics, Statistics, and Physics, and concentrations in Molecular Cell Physiology, Advanced Chemistry, Biochemistry, Chemical Physics, Cytotechnology, Medical Laboratory Science, and Statistics.

The School of Science also offers master’s degrees in Computer Science, Information Systems, and Software Engineering. The undergraduate Bachelor of Science in Computer Science Advanced Computing Concentration program is accredited by the Computing Accreditation Commission of ABET, http://www.abet.org. The undergraduate Bachelor of Science in Software Engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. The Chemistry and Physics Department is approved by the American Chemical Society (ACS). All qualified advanced chemistry, biochemistry, and chemical physics degree recipients are eligible to receive ACS certification of their degrees. The degrees in Clinical Laboratory Science and Medical Laboratory Science are accredited by the Commission on Accreditation of Allied Health Education Professions (CAAHEP) or by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS). All programs of
study are directed toward preparing students for working and living in a multicultural, technologically complex, global environment.

Studies in the School of Science provide students with a solid background in the technical aspects of their chosen scientific or engineering field, sufficient to prepare them for further study in graduate or professional programs, or to compete for access to employment opportunities in industry or education. Core courses for the non-major stress the nature of the scientific enterprise and the benefits and risks that scientific advances present to society rather than the digestion of large doses of content from the discipline. Both major and non-major courses emphasize the importance of critical thinking and cooperative learning, clarify working to the scientific method in posing and answering questions concerning the natural world, and explore the nature of human problems for which technology may provide solutions.

RAPID RESPONSE INSTITUTE

Barbara T. Reagor, PhD. Director, Rapid Response Institute. A Bellcore Fellow and former Telcordia VP of Homeland Security, Dr. Reagor worked has worked for the past thirty-four years in the fields of National Security Emergency Preparedness, Disaster Prevention and Recovery, Crisis Management, Chemical Contamination, and Network Risk Assessment associated with telecommunications and information technology systems.

William Tepfenhart, PhD. Chief Technology Officer for the Rapid Response Institute and Associate Professor in the Department of Computer Science and Software Engineering. Dr. Tepfenhart's experience ranges across a broad spectrum of activities (government, AT&T, and Monmouth University). He has performed in the role of instructor, researcher, software developer, and author. He is trained as a physicist, and his areas of expertise include object-oriented software development, artificial intelligence, and software engineering.

James Hammill, Research Scientist for the Rapid Response Institute and a Certified Disaster Recovery Planner. He was co-chair for the Response and Recovery Chapter with Dr. Reagor for the Memorial Institute for the Prevention of Terrorism (MIPT) publication “Project First Responder.” He has also held positions at FEMA and AT&T.

Robert M. Kelly Jr., MSEE Stanford University. Adjunct Professor, Monmouth University. Synthesis of emerging and existing technologies into useful applications; Radio Frequency Identification (RFID), large scale systems architecture, and integration; work in all phases of technology development from the lab to customer support; operations, administration, and maintenance (OA&M) of complex computer/communications environments; customer/client and vendor relationship management, especially outsourcing; and processes for quality technology realization and support.

The Rapid Response Institute (RRI) provides research opportunities in support of Homeland Security and Homeland Defense for School of Science faculty and adjuncts as well as high school teachers and students, undergraduate and graduate students, and contracted or visiting scientists. This software engineering-based institute aims to develop decision-enhancing aids that enable early and enhanced threat identification and appropriate response in the support of chemical, biological, radiological, nuclear, and explosive events. These same techniques can be applicable to homeland security/counterterrorism, natural disaster, environmental crisis, and pandemic scenarios, and this duality provides an open, accessible, and reasonably inexpensive test bed for the development of prototypes being designed to meet both domestic and military needs.

URBAN COAST INSTITUTE

Anthony B. MacDonald, Director. Mr. MacDonald brings over twenty-five years of executive and policy experience in coastal and ocean law and policy at the local, state, and federal level to the Urban Coast Institute (UCI).

James Nickels, Marine Scientist, Urban Coast Institute. Mr. Nickels has worked for over twenty-five years on marine research, monitoring, surveying, and field operations in both the public and private sectors.

The Urban Coast Institute (UCI) serves the public interest as a forum for research, education, and collaboration that fosters the application of the
best available science and policy to support healthy and productive coastal ecosystems and a sustainable and economically vibrant future for coastal communities. The UCI efforts focus on the following program areas:

- Coastal Law and Policy
- Coastal Watershed Management
- Coastal Communities and Economies
- Regional Ecosystem Management

**BIOLOGY**

_Bernadette Dunphy, Interim Chair, Department of Biology_

**Pedram Patrick Daneshgar, Assistant Professor.**
BA, University of Delaware; MS, Saint Joseph's University; PhD, University of Florida. Dr. Daneshgar's research interests include community and ecosystem ecology of coastal systems including dunes and mangroves, impacts of invasive plant species, and diversity maintenance mechanisms of grasslands.

**Ellen Doss-Pepe, Lecturer.** PhD, Rensselaer Polytechnic Institute. Specializes in biochemistry, protein folding and misfolding, and protein degradation. Current interests include the relationship of protein misfolding and degradation as underlying causes of neurodegenerative diseases and the roles of antioxidant proteins in cells during oxidative stress and neurodegeneration.

**Bernadette Dunphy, Specialist Professor and Interim Chair.** PT, D.PT, University Medicine and Dentistry, NJ. Specializes in physical therapy, sports medicine, and anatomy and physiology.

**Ivan A. Gepner, Associate Professor.** PhD, Princeton University. Specializes in genetics and developmental biology. Current interests include computer applications in biology, especially computer modeling and simulation of natural phenomena.

**Ursula A. Howson, Assistant Professor.** PhD, University of Delaware. Specializes in marine ecology, ichthyology, and invertebrate zoology. Current research includes physiological ecology and behavior of larval and juvenile fishes, and image-based analyses of ontogenetic changes in their morphology.

**Kathryn A. Lionetti, Associate Professor.** PhD., State University of New York at Stony Brook. Specializes in microbiology and molecular biology. Current interests include recombinant DNA technology, apoptosis, and applications of molecular biology in clinical diagnostic procedures and emerging viral diseases.

**Dorothy Lobo, Associate Professor.** PhD, The Catholic University of America. Specializes in cell and molecular biology, and signal transduction pathways. Current research includes the regulation of stress signaling pathways during cell proliferation and programmed cell death.

**James P. Mack, Professor.** EdD, Teachers College, Columbia University. Specializes in anatomy and physiology. Current research includes: antimicrobial effects of plant essential oils on bacteria including MRSA and MSSA and fungi and elucidating the comprehensive chemical mechanism for catalase (kinetic deviations and conformer multiplicity).

**Tiffany Medley, Lecturer.** PhD, City University of New York. Specializes in environmental policy, estuarine ecology and ecosystem restoration. Current research includes evaluating the abundance and health of wild oysters in the Hudson River Estuary.

**Michael A. Palladino, Dean, School of Science and Professor.** PhD, University of Virginia. Specializes in male reproductive biology and cell and molecular biology. Current research includes antimicrobial properties of male reproductive organs, and cellular and molecular responses to ischemia and hypoxia in the mammalian testis.

**Karen Pesce, Lecturer.** PhD, Rutgers University. Specializes in environmental microbiology. Current research interests include microbial community analysis and characterization of novel biodegradative genes from polluted environments.

**Dennis E. Rhoads, Professor.** PhD, University of Cincinnati. Specializes in biochemistry and neuroscience. Current research on neurobiology of alcohol and drug abuse.

**John A. Tiedemann, Assistant Dean of the School of Science and Director of the Marine and Environmental Biology and Policy Program.** MS, Florida Institute of Technology. Specializes in marine ecology, coastal zone management, environmental science, and marine environmental education. Current applied research involves watershed management strategies and best management practices for coastal nonpoint source pollution.
Jeffrey H. Weisburg, Specialist Professor. PhD, Cornell University-Weill Graduate School of Biomedical Sciences. Specializes in Anatomy and Physiology and Immunology. Current research involves the use of nutraceuticals, food derivatives that have pharmacological properties, to treat cancers of the oral cavity and leukemia.

DEPARTMENT OF CHEMISTRY AND PHYSICS
William Schreiber, Chair, Department of Chemistry and Physics


Bradley J. Ingebrethsen, Lecturer. PhD, Clarkson University. Physical chemistry. Mass transport in aerosol systems, the fate of aerosols in the environment and in the respiratory tract, and the physical chemistry of cigarette smoke.

Dmytro Kosenkov, Assistant Professor. Ph.D., Chemistry, Jackson State University, Physical chemistry. Research interests: investigation of energy transfer in photosynthetic complexes to design new types of solar cells, modeling light sensitive proteins for non-invasive control of neurons, speeding-up computational chemistry using graphics processing units (GPUs).

Robin R. Kucharczyk, Lecturer. PhD, Yale University. Inorganic chemistry. Organometallic chemistry of molybdenum and approaches to teaching introductory chemistry.

Massimiliano Lamberto, Associate Professor. PhD, University of Southampton (UK). Organic chemistry. Research interests: small molecule synthesis for the inhibition of telomerase by G-quadruplex DNA stabilization; synthesis of novel chromophoric systems for dye-sensitized solar cells and sensor applications; synthetic methodology.

Kayla Lewis, Assistant Professor. PhD, Georgia Institute of Technology. Geophysics research interests: computer modeling of processes associated with climate change.

Gregory Moehring, Associate Professor. PhD, Purdue University. Inorganic Chemistry. Research interests: synthesis and NMR characterizations of transition metal polyhydride compounds. Transformations of small molecules at transition metal polyhydride compounds.

Datta V. Naik, Vice Provost, Dean of the Graduate School and Professor. PhD, University of Notre Dame. Analytical-inorganic chemistry. Research interests: detection and control of process gases, air quality, and spectroscopic methods of analysis.

Jonathan Ouellet, Assistant Professor. PhD, University of Sherbrooke. Biochemistry. Research interests: nucleic acid structure and folding dynamics.

Ellen Rubinstein, Lecturer. PhD, University of Notre Dame. Materials Engineering. Polymer chemistry, water analysis related to coastal lake eutrophication.


Danuta Szwajkajzer, Lecturer. PhD, Rutgers University. Biophysical chemistry. Chemistry of proteins and nucleic acids, thermodynamics of drugs binding to DNA, mechanisms of recognition for biomolecules, and studies of structure and thermodynamic changes of nucleic acids oligomers.

Tsanangurayi Tongesayi, Associate Professor. PhD, West Virginia University. Analytical chemistry. Research interests: speciation, geochemical cycling, bioavailability of heavy metals in the environment, technologies and methods for the removal of toxic heavy metals and their compounds from drinking water, and analytical method development.

COMPUTER SCIENCE AND SOFTWARE ENGINEERING

Jiacun Wang, Chair, Department of Computer Science and Software Engineering

Joseph Chung, UNIX Administrator and Teacher

James McDonald, Associate Professor. PhD, New York University. Interests include software verification and validation, project management, and empirical software engineering.

Allen Milewski, Associate Professor. PhD, Brown University. Areas of interest include human-com-
puter interactions, contextual communication and awareness, and global software development.

Mohammed S. Obaidat, Professor. PhD, Ohio State University. Interests include wireless communications and networks; telecommunications and networking systems; security of network, information, and computer systems; security of e-based systems; performance evaluation of computer systems, algorithms, and networks; modeling and simulation; high performance and parallel computing/ computers; applied neural networks and pattern recognition; adaptive learning; and speech processing.

Daniela Rosca, Associate Professor. PhD, Old Dominion University. Interests include requirements elicitation, analysis and specification, and methodologies for the development and use of business rules.

Richard Scherl, Associate Professor. PhD, University of Illinois and University of Chicago. Interests include artificial intelligence (especially knowledge representation, automated reasoning, and natural language processing), cognitive science, and databases.

William Tepfenhart, Professor. PhD, University of Texas. Interests include artificial intelligence, software architecture, and software design.

Jack M. Van Arsdale, Associate Professor. MSEE, Polytechnic Institute of New York. Interests include digital and microcomputer-based design, digital phase-lock loop frequency synthesis, and digital synthesis.

Jiacun Wang, Professor and Chair. PhD, Nanjing University of Science and Technology, China. Interests include software architecture, Petri nets, real-time systems, discrete event systems, telecommunications, and networking.

Cui Yu, Associate Professor. PhD, National University of Singapore. Interests include database management systems, spatial databases, and information storage and retrieval.

MASTER OF SCIENCE IN COMPUTER SCIENCE (MS)

The Master of Science in Computer Science provides a broad background in graduate-level computer science study. The thirty- to forty-five-credit program allows the student to choose a thesis option or a non-thesis option. Students may also choose to specialize in Computer Networks, Databases and Intelligent Information Systems, or Security of Information Systems and Networks. When the applicant has a strong background in computer science, such as a bachelor’s degree in computer science with excellent standing, up to fifteen credits (CS501B-CS509) may be waived. Other majors may be required to take some or all of these courses. These foundation courses must be completed with a minimum GPA of 3.0, and all prerequisite courses must be passed with a grade of “B-” or better.

Please refer to the curriculum charts in the appendix for program requirements. All curriculum charts are detailed and displayed in Appendix “B.”

- MS Computer Science, Thesis or Non-Thesis Track
- MS Computer Science, Computer Networks, Thesis or Non-Thesis Track
- MS Computer Science, Databases and Intelligent Information Systems, Thesis or Non-Thesis Track
- MS Computer Science, Security of Information Systems and Networks, Thesis or Non-Thesis Track

GRADUATE CERTIFICATE IN COMPUTER SCIENCE: SOFTWARE SYSTEMS DESIGN AND DEVELOPMENT

The Graduate Certificate Program in Computer Science: Software Systems Design and Development is specifically designed to provide essential software development skills, including computer programming, data structures, algorithms, and operating systems for graduates of programs with minimal or no computer science training. Those students receiving the certificate will be:

- Knowledgeable of and competent in the use of object-oriented programming languages and techniques, including advanced features of Java and C++ and efficient code design;
- Knowledgeable of fundamental data structures and computing algorithms;
- Knowledgeable of operating system concepts, design, development, and applications;
- Able to design and develop computer programs of realistic and practical complexity, either as individuals or as part of a team.
The certificate program will generally be a three- to five-course sequence, depending on the prior programming skills of the applicant. A student can be admitted to the certificate program with "advanced standing," having been given credit for relevant experience or courses taken previously. However, a student must take at least three courses in the sequence at Monmouth in order to receive the certificate. If the applicant has some programming background, but insufficient or non-recent training with modern programming languages, he or she can be conditionally admitted and required to take a sixth course, CS501A, as an alternative to delaying admission while the programming prerequisite is being met.

The certificate program is intended to serve primarily part-time students employed by area business, education, and government organizations. It may also be an opportunity for professional development, career change, or career enhancement in situations where computer programming is a valued skill. Upon completion of the program with a GPA of 3.00 or better, the student will receive a certificate and guaranteed admission to the Computer Science Graduate Program at Monmouth University. However, none of the certificate courses can be applied to the main eleven-course master's degree requirement.

Please refer to the curriculum chart in the appendix for program requirements. All curriculum charts are detailed and displayed in Appendix "B."

- Certificate Software Systems Design and Development

MASTER OF SCIENCE IN INFORMATION SYSTEMS (MSIS)

The MSIS is a unique degree program that educates students about how to apply computing technology to business programs. With courses offered through the School of Science and the Leon Hess Business School, the MSIS prepares students for employment in the Information Technology (IT) sector at a management level. The program benefits are:

- Focus on the technology or management side of information systems by choosing one of two distinct tracks;
- Become an effective team member, including teams that are international and geographically distributed;
- Excel at project management and management and improve business decision-making;
- Learn how to reconcile conflicting project objectives;
- Be eligible to apply for positions such as business systems analyst, software project manager, software requirements developer, information technology operations manager, and customer support specialist.

The MSIS also allows students to gain full and thorough training in information systems, which can be used as a basis for pursuing certifications such as the Certified Information Systems Security Professional (CISSP), Project Management Professional (PMP), and the Certified Software Development Professional (CSDP).

Please refer to the curriculum charts in the appendix for program requirements. All curriculum charts are detailed and displayed in Appendix "B."


MASTER OF SCIENCE IN SOFTWARE ENGINEERING (MS)

Monmouth University was one of the first institutions in the United States to recognize the newly emerging discipline of Software Engineering by establishing a separate department to specialize in this strategic engineering discipline. The department offers a Master of Science Degree in Software Engineering and two graduate certificate programs: the Certificate in Software Development and the Certificate in Software Engineering.

The objective of the master's degree program is for the student to master the necessary skills and knowledge that allow him or her to be an effective member of a software development team. The program's educational objectives are to prepare students so that upon graduation they will:

1. Show mastery of the software engineering knowledge and skills and professional issues necessary to practice as a software engineer in a variety of application domains with demonstrated performance in at least one application domain;
2. Understand the relationship between software engineering and systems engineering and be
able to apply systems engineering principles and practices in the engineering of software;

3. Show mastery of software engineering in at least one specialty, such as embedded devices, safety critical systems, highly distributed systems, software engineering economics, or one of the knowledge areas of the Graduate Software Engineering Reference Curriculum (GSWERC) body of knowledge;

4. Work effectively as part of a team, including teams that may be international and geographically distributed, to develop quality software artifacts, and to lead in one area of project development, such as project management, requirements analysis, architecture, construction, or quality assurance;

5. Reconcile conflicting project objectives, finding acceptable compromises within limitations of cost, time, knowledge, existing systems, and organizations;

6. Design appropriate software engineering solutions that address ethical, social, legal, and economic concerns;

7. Understand and appreciate the importance of feasibility analysis, negotiation, effective work habits, leadership, and good communication with stakeholders in a typical software development environment;

8. Learn new models, techniques, and technologies as they emerge, and appreciate the necessity of such continuing professional development;

9. Analyze a current significant software technology, be able to articulate its strengths and weaknesses, and be able to specify and promote improvements or extensions to that knowledge.

All classes are held in the late afternoon, and most of our students are from New Jersey’s premier software industries. The department offers the entire program at the main campus of Monmouth University. The Master of Science in Software Engineering degree is a thirty-credit curriculum, with four core courses, four advanced elective courses, and a six-credit thesis or practicum. The core courses provide the student with the foundations of modern software engineering. When the applicant has a background other than computer science or software engineering, up to twelve credits of foundation courses may be required before registering for the core courses. These foundation courses must be passed with a grade of “B-” or better. Students can opt for writing a thesis or participating in a group practicum for two semesters as their capstone experience before graduation.

For students who have already completed a bachelor’s degree in software engineering, the department offers an advanced track, which gives students the opportunity to earn a master’s degree after completion of a thirty-credit curriculum. In addition, students may choose between two paths within this track, the thesis or non-thesis option. If students choose the thesis option, they will complete the core courses, research and write a thesis over two semesters, and choose and complete two pairs of advanced elective courses. Students who choose the non-thesis option will complete the core courses and choose and complete three pairs of advanced elective courses. Finally, all students will take one advanced elective course from the list of non-paired courses.

**Please refer to the curriculum charts in the appendix for program requirements. All curriculum charts are detailed and displayed in Appendix “B.”**

- MS in Software Engineering
- MS in Software Engineering, Advanced Track

**SOFTWARE ENGINEERING CERTIFICATE PROGRAMS**

The certificate in Software Development, which includes fifteen credits of foundation courses plus a three-credit project course, prepares students to become proficient software developers. It also serves as a foundation for those who do not have the necessary background but hope to enter the master’s degree program. It is the ideal starting point for those holding bachelor’s degrees in disciplines other than software engineering or computer science who are interested in a career in software engineering or who hope to do software development in their chosen field.

The certificate in Software Engineering is an eighteen-credit program that prepares graduates to become effective members of a software development team. Students gain an understanding of team capability, dynamics, and performance. Requirements include the fifteen credits of core courses needed for the Master of Science in Software Engineering, as well as a course (three credits) in software project management. (Up to fif-
teen credits of foundation courses may also be required.) Upon completion of this program, students will have the ability to design software that solves practical problems, a critical skill for career success and advancement.

Please refer to the curriculum charts in Appendix “B” for program requirements.

- Certificate in Software Development
- Certificate in Software Engineering

**MATHEMATICS**

**David C. Marshall**, Chair, Department of Mathematics

**Richard Bastian**, Lecturer. PhD, Johns Hopkins University. Interests include applied mathematics, mathematics and culture, and philosophy of mathematics.

**Barbara Lynn Bodner**, Professor. EdD, Rutgers University. Interests include heuristic process use in problem solving, integration of computer technology, and applications into the curriculum, as well as the study of mathematics from historical and artistic perspectives.

**Micah Chrisman**, Associate Professor. PhD, University of Hawaii. Interests include algebraic topology, low-dimensional topology, and knot theory.

**Joseph Coyle**, Associate Professor. PhD, University of Delaware. Interests include numerical analysis and inverse problems.

**Bonnie Gold**, Professor. PhD, Cornell University. Interests include philosophy of mathematics and innovation in undergraduate mathematics education.

**Zachary Kudlak**, Assistant Professor. PhD, University of Rhode Island. Interests include combinatorics, difference equations, graph theory, and mathematical pedagogy.

**Betty Liu**, Professor. PhD, University of Maryland. Interests include numerical solution of differential equations and mathematical modeling.

**David C. Marshall**, Associate Professor and Chair, PhD, University of Arizona. Interests include number theory, commutative algebra, and the theory of bilinear and quadratic forms.

**Susan H. Marshall**, Associate Professor. PhD, University of Arizona. Interests include number theory, arithmetic geometry, and the learning and teaching of proof.

**Emanuel Palsu-Andriescu**, Lecturer. PhD, University of Rochester. Interests include microlocal analysis, Colombeau generalized functions, and Fourier integral operators.

**Wai K. Pang**, Associate Professor. PhD, Texas Tech University. Interests include functional data analysis, image analysis, and multi-sample problems in Hilbert spaces.

**Sandra Zak**, Lecturer. PhD, University of New Hampshire. Interests include operator algebras, C*- algebras, curriculum development, and the mathematical preparation of teachers.