

The School of Science

DEAN: Michael A. Palladino, Ph.D.

ASSISTANT DEAN: John A. Tiedemann, M.S.

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 life-long 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 – Policy Track, Marine and Environmental Biology and Policy – Biomolecular Track, Mathematics, Medical Technology

and Software Engineering, as well as minors in Biology, Chemistry, Computer Science, Information Technology, Mathematics, and Physics, and concentrations in Molecular Cell Physiology, Advanced Chemistry, Biochemistry, Chemical Physics, Cytotechnology, and Medical Laboratory Science.

The School of Science also offers master's degrees in Computer Science, Software Engineering and Financial Mathematics. The program in Software Engineering is accredited by the Accreditation Board for Engineering and Technology (ABET). The Chemistry, Medical Technology, 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 Technology are accredited 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, Ph.D. Director, Rapid Response Institute. A Bellcore Fellow and former Telcordia VP of Homeland Security, Dr. Reagor worked for the past 34 years in the fields of National Security Emergency Preparedness, Disaster Prevention & Recovery, Crisis Management, Chemical Contamination, and Network Risk Assessment associated with telecommunications and information technology systems.

William Tepfenhart, Ph.D. 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, ATT and MU). He has performed in the role of instructor, researcher, software developer, and author. Trained as a physicist, 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 MIPT publication "Project First Responder". He has also held positions at FEMA and AT&T.

Robert M. Kelly Jr., Adjunct Professor - M.S.E.E. Stanford University. Synthesis of emerging and existing technologies into useful applications; 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 the chemical, biological, radiological, nuclear, and explosive events. These same techniques can be applicable to homeland security/counter-terrorism, 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 designated to meet both domestic and military needs.

URBAN COAST INSTITUTE

Anthony B. MacDonald, Director, Urban Coast Institute. 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 UCI.

Jennifer DiLorenzo, Sustainable Coastal Communities Liaison, Urban Coast Institute. Ms. DiLorenzo is a marine scientist who has worked with the New York and New Jersey Legislatures, the New Jersey Department of Environmental Protection, and the private sector.

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

Dennis Rhoads, Chair, Department of Biology

Donald Dorfman, Professor. Ph.D., Rutgers University. Specializes in ichthyology, ecology, and marine biology. Current research involves population estimates of fishes, fish physiology, bioaccumulation of heavy metals, responses of fishes to variations in environmental parameters, and research on avian hemoglobin, fish parasites, and structure of gonopodia of live-bearing fishes.

Ellen Doss-Pepe, Instructor. Ph.D., 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.

Ivan A. Gepner, Associate Professor. Ph.D., 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. Ph.D., 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.

Dorothy Hutter Lobo, Associate Professor. Ph.D., 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.

Kathryn A. Lionetti, Associate Professor. Ph.D., 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, emerging viral diseases.

James P. Mack, Professor. Ed.D., Teachers College, Columbia University. Specializes in anatomy and physiology, vitamin A and membranes. Current research includes antibiotic screening of plants from Belize and spread of human pathogens by migratory birds, and antimicrobial activity of essential oils.

Michael A. Palladino, Dean, School of Science and Associate Professor. Ph.D., 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.

Dennis E. Rhoads, Professor. Ph.D., 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 Specialist Professor. M.S., Florida Institute of Technology. Specializes in marine ecology, coastal zone management, environmental science, and marine and environmental education. Current applied research involves watershed management strategies and best management practices for coastal non-point source pollution.

CHEMISTRY, MEDICAL TECHNOLOGY, AND PHYSICS

William Schreiber, Interim Chair, Department of Chemistry, Medical Technology, and Physics

Azzam S. Elayan, Lecturer. Ph.D., Wesleyan University. Organometallic chemistry. Synthesis and characterization of hybrid (organic-inorganic) polymers and catalytically active organometallic complexes; mechanisms of metal-catalyzed processes, particularly those involving carbon-carbon bond-forming reactions.

Bradley J. Ingebrethsen, Lecturer. Ph.D., 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.

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

Massimiliano Lamberto, Assistant Professor. Ph.D., University of Southampton (U.K.). Organic chemistry. 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.

Kanchana Mudalige, Lecturer. Ph.D., University of Illinois. Analytical chemistry and electronic engineering.

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

William L. Schreiber, Lecturer. Ph.D., University of Rochester. Organic chemistry. Organic synthesis, process research, organic photochemistry, odor perception, and chemical education.

Carolyn Supplee, Assistant Professor. Ph.D., The Ohio State University. Inorganic and analytical chemistry. Syntheses and reactivity of transition metal complexes for the development of environmentally benign processes and techniques ("green chemistry") to conduct C-H activation and oxidation chemistry. Characterization of metal complexes and their reaction chemistry utilizing physical and analytical methods.

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

Tsanangurayi Tongesayi, Assistant Professor. Ph.D., West Virginia University. Analytical chemistry. Speciation, geochemical cycling and 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.

Theresa Julia Zielinski, Professor. Ph.D., Fordham University. Physical chemistry. Study of molec-

ular structure and reactivity through computer modeling, intercollegiate cooperative learning, design of modern pedagogical approaches in chemical education, and physical chemistry curriculum design.

COMPUTER SCIENCE AND SOFTWARE ENGINEERING

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

Joseph Chung, Unix Administrator and Teacher
Maureen Paparella, Director of Information Technology

Michiko Kosaka, Associate Professor. Ph.D., New York University. Interests include natural language processing and artificial intelligence.

Francis C. Lutz, Professor. Ph.D., New York University. Interests include environmental engineering and curricular innovation. Active in educational issues through the American Society for Engineering Education and the National Society of Professional Engineers.

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

Allen Milewski, Associate Professor. Ph.D., Brown University. Areas of interest include human-computer interactions, contextual communication and awareness, and global software development.

Mohammed S. Obaidat, Professor. Ph.D., 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. Ph.D., Old Dominion University. Interests include requirements elicitation, analysis and specification and methodologies for the development and use of business rules.

Richard Scherl, Associate Professor. Ph.D., University of Illinois. Interests include artificial intelligence (especially knowledge representa-

tion, automated reasoning, and natural language processing), cognitive science, and information systems.

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

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

Jiacun Wang, Associate Professor. Ph.D., Nanjing University of Science and Technology. Interests include software architecture, Petri nets, real time systems, discrete event systems, telecommunications, and networking.

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

MASTER OF SCIENCE IN COMPUTER SCIENCE (M.S.)

The Master of Science in Computer Science provides a broad background in graduate-level computer science study. The 32- to 45-credit program allows the student to choose a thesis option (Track “A”) or a non-thesis option (Track “B”). Students may also optionally 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 15 credits (CS501B-CS509) may be waived. Other science and engineering 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”.

- M.S. Computer Science, General (Track “A” or Track “B”)
- M.S. Computer Science, Computer Networks (Track “A” or Track “B”)
- M.S. Computer Science, Databases and

Intelligent Information Systems (Track “A” or Track “B”)

- M.S. Computer Science, Security of Information Systems and Networks (Track “A” or Track “B”)

GRADUATE CERTIFICATE IN COMPUTER SCIENCE

(Please refer to the curriculum charts in appendix “B” for program requirements.)

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 use of object-oriented programming languages and techniques, including advanced features of 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 develop-

ment, 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 11-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".

- Software Systems Design and Development
- Graduate Certificate in Computer Science

MASTER OF SCIENCE IN SOFTWARE ENGINEERING (M.S.)

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 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 36-credit curriculum, with five core courses, five advanced elective courses, and a six-credit thesis or practicum. The core courses provide the student with the foundations of modern software engineering. Two of those courses will be waived for students who have a bachelor's degree in software engineering and who choose to complete a thesis.

The Software Engineering Master's Degree Program offers six interdisciplinary tracks. Students take 15 credits of electives, which may focus on one of the following tracks: The Organizational Management track, which prepares students to become software development managers or specialists in software process improvement; The Telecommunications track, which prepares students

to become specialists in telecommunications software development; The Embedded Systems track, which prepares students to become specialists in real-time embedded systems development; The Information Management Track which prepares students to be chief information officers or specialists in information systems integration and development; The Management of Software Technology track, which prepares students to be chief technology officers or specialists in the acquisition of software systems for businesses; or The Thesis Track, which prepares students who enter the program with a BSSE degree to specialize in two of the fields associated with the tracks outlined above.

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

- M.S. in Software Engineering
- M.S. in Software Engineering, Embedded Systems Track
- M.S. in Software Engineering, Information Management Track
- M.S. in Software Engineering, Management of Software Technology Track
- M.S. in Software Engineering, Organizational Management Track
- M.S. in Software Engineering, Telecommunications Track
- M.S. in Software Engineering, Thesis Track

SOFTWARE ENGINEERING CERTIFICATE PROGRAMS

The certificate in Software Development, which includes 15 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 18-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

15 credits of core courses needed for the Master of Science in Software Engineering, as well as a course (3 credits) in software project management. (Up to 15 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 the Appendix "B" for program requirements.

- Certificate in Software Development
- Certificate in Software Engineering

MATHEMATICS

*Joseph Coyle and David Marshall, Co-Chairs,
Department of Mathematics*

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

Barbara Lynn Bodner, Professor. Ed.D., 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.

Suneal Chaudhary, Assistant Professor. Ph.D., UCLA. Interests include mathematical and computational finance, economics, and Monte Carlo methods.

Micah Chrisman, Assistant Professor. Ph.D., University of Hawaii. Interests include algebraic topology, low-dimensional topology, and knot theory.

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

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

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

David C. Marshall, Associate Professor, Ph.D., University of Arizona. Field is Number Theory. Interests include algebraic number theory, bilinear and quadratic forms, and undergraduate mathematics curriculum.

Susan H. Marshall, Assistant Professor. Ph.D., University of Arizona. Field is number theory. Interests include number theory, arithmetic geometry, and the learning and teaching of proof.

Wai K. Pang, Assistant Professor. Ph.D., Texas Tech University. Interests include functional data analysis, image analysis, and multi-sample problems in Hilbert spaces

Bruce Ralli, Lecturer. M.S., Georgian Court University. Interests include teaching mathematics and technology in the classroom.

G. Boyd Swartz, Professor. Ph.D., New York University. Interests include computer modeling, object-oriented programming, and integration of computer technology into the curriculum.

MASTER OF SCIENCE IN FINANCIAL MATHEMATICS (M.S.)

The Master of Science in Financial Mathematics provides a degree that integrates mathematics and financial applications at the graduate level in order to provide well-trained students who would enter and be successful in the local financial sector.

The goals of the program are to prepare quantitative financial analysts for successful employment, produce scholarship in the area of financial mathematics, and provide the surrounding community with a viable opportunity to augment current financial skills with new and analytical knowledge.

The MSFM requires applicants to have earned an undergraduate degree in mathematics, or majored in a related field that requires a substantial component of mathematics such as physics, electrical or computer engineering. Business, computer science or related majors with a minor in mathematics are also acceptable. Applicants must have com-

pleted Calculus I,II, and III, Linear Algebra, Differential Equations (with some exposure to partial differential equations) and a course in Calculus-based Statistics. Applicants must have a minimum overall GPA of 3.0 in their major and 2.5 overall. Applicants who have not previously completed courses in the areas of Calculus, Linear Algebra, Differential Equations or Statistics will be evaluated on a case-by-case basis. They may be required to complete a foundation curriculum before entering the master's program.

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 Financial Mathematics

PHYSICS

William Schreiber, Interim Chair, Department of Chemistry, Medical Technology, and Physics

Derek A. Barnes, Professor. Ph.D., Oxford University. Interests include theory of programming languages, artificial intelligence, controlled fusion, and plasma instabilities.

Louis J. Kijewski, Professor. Ph.D., New York University. Fields of interest are electromagnetic theory, mechanics, and quantum mechanics. Most recent interests include many-body problem, optical fibers, computer calculations in atomic physics, and group theory.

S. Mallikarjun, Professor. Ph.D., University of London, U.K. Primary field is liquid state physics. Current interests include study of crystals and international education.