

VIII. School of Engineering

Officers of Instruction Faculty

Charles C. Nguyen, D.Sc.	<i>Dean and Professor of Electrical Engineering and Computer Science</i>
Jandro Abot, Ph.D.	<i>Clinical Associate Professor of Mechanical Engineering</i>
Bismark R. D. Agbelie, Ph.D.	<i>Assistant Professor of Civil Engineering</i>
Gregory Behrmann, Ph.D.	<i>Clinical Assistant Professor of Biomedical Engineering</i>
Ujjal Bhowmik, Ph.D.	<i>Clinical Assistant Professor of Electrical Engineering and Computer Science</i>
J. Steven Brown, Ph.D., P.E.	<i>Professor of Mechanical Engineering</i>
Mario J. Casarella, Ph.D.	<i>Professor Emeritus of Mechanical Engineering</i>
Lin-Ching Chang, Ph.D.	<i>Associate Professor of Electrical Engineering and Computer Science</i>
Chanseok Jeong, Ph.D.	<i>Assistant Professor of Civil Engineering</i>
John A. Judge, Ph.D.	<i>Associate Professor of Mechanical Engineering</i>
Timothy W. Kao, Ph.D., P.E.	<i>Professor Emeritus of Civil Engineering</i>
Ozlem Kilic, D.Sc.	<i>Associate Professor of Electrical Engineering and Computer Science</i>
Eric Kommer, Ph.D., P.E.	<i>Assistant Professor of Mechanical Engineering</i>
Sahana N. Kukke, -Ph.D.	<i>Assistant Professor of Biomedical Engineering</i>
Sang Wook Lee, Ph.D.	<i>Associate Professor Biomedical Engineering</i>
Hang Liu, Ph.D.	<i>Associate Professor in Electrical Engineering and Computer Science</i>
Max Liu, Ph.D.,P.E.	<i>Assistant Professor of Civil Engineering</i>
Gunnar Lucko, Ph.D.	<i>Associate Professor of Civil Engineering</i>
Peter Lum, Ph.D.	<i>Associate Professor of Biomedical Engineering</i>
Xiaolong Luo, Ph.D.	<i>Assistant Professor of Mechanical Engineering</i>
Arash Massoudieh, Ph.D.	<i>Associate Professor of Civil Engineering</i>
John J. McCoy, D.Sc.	<i>Professor Emeritus of Civil Engineering</i>
Robert Meister, Ph.D.	<i>Professor Emeritus of Electrical Engineering and Computer Science</i>
Nader M. Namazi, Ph.D.	<i>Professor of Electrical Engineering and Computer Science</i>
George Nehmetallah, Ph.D.	<i>Assistant Professor of Electrical Engineering and Computer Science</i>
Sen Nieh, Ph.D.	<i>Professor of Mechanical Engineering</i>
Masataka Okutsu, Ph.D.	<i>Clinical Assistant Professor of Civil Engineering</i>
Hsien Ping Pao, Ph.D.	<i>Professor Emeritus of Civil Engineering</i>
Erion Plaku, Ph.D.	<i>Associate Professor of Electrical Engineering and Computer Science</i>
Christopher Raub, Ph.D.	<i>Assistant Professor of Biomedical Engineering</i>
Phillip A. Regalia, Ph.D.	<i>Professor of Electrical Engineering and Computer Science</i>
Patricio D. Simari, Ph.D.	<i>Assistant Professor of Electrical Engineering and Computer Science</i>
Michael C. Soteriades. D.Sc., P.E.	<i>Professor Emeritus of Civil Engineering</i>
Lu Sun, Ph.D.	<i>Professor of Civil Engineering</i>
Harold Szu, Ph.D.	<i>Research Ordinary Professor of Biomedical Engineering</i>
Binh Q. Tran, Ph.D.	<i>Associate Professor of Biomedical Engineering</i>
Diego Turo, Ph.D.	<i>Clinical Assistant Professor of Mechanical Engineering</i>

Joseph Vignola, Ph.D.	<i>Associate Professor of Mechanical Engineering</i>
Zhaoyang Wang, Ph.D.	<i>Associate Professor of Mechanical Engineering</i>
Yun Chow Whang, Ph.D.	<i>Professor Emeritus of Mechanical Engineering</i>
Otto C. Wilson, Ph.D.	<i>Associate Professor of Biomedical Engineering</i>

Associates of the Faculty

Mostafa Ardakani, Ph.D.	<i>Lecturer in Civil Engineering</i>
Ejaz Azad, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Abdella Battou, Ph.D.	<i>Adjunct Assistant Professor of Electrical Engineering and Computer Science</i>
John Bonita, Ph.D., P.E.	<i>Lecturer in Civil Engineering</i>
Charles E. Campbell Jr., Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Alan B. Carr, M.S.	<i>Lecturer in Engineering Management</i>
Vincent Casella, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Isaac Chang, Ph.D.	<i>Adjunct Assistant Professor of Biomedical Engineering</i>
Keefe Coburn, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Aysegul Cuhadar, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Jeffrey R. Didion, M.S.	<i>Lecturer in Mechanical Engineering</i>
Azad Ejaz, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Joseph Findaro, J.D.	<i>Lecturer in Civil Engineering</i>
Jeffrey E. Fernandez, Ph.D., P.E., C.P.E.	<i>Lecturer in Engineering Management</i>
Larry D. Ferreira, Ph.D.	<i>Lecturer in Engineering Management</i>
Christy Foreman	<i>Lecturer in Biomedical Engineering</i>
Jeffrey E. Giangliuli, M.S.E.	<i>Lecturer in Engineering Management</i>
Wenjun Gu, M.S.	<i>Lecturer in Civil Engineering</i>
Shane Guan, Ph.D.	<i>Lecturer in Mechanical Engineering</i>
Lei He, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Liling Huang	<i>Lecturer in Electrical Engineering and Computer Science</i>
James W. Hudson	<i>Lecturer in Civil Engineering</i>
Boyd A. Jones, Ph.D.	<i>Lecturer in Engineering Management</i>
Philip C. Jones, J.D.	<i>Lecturer in Civil Engineering</i>
Vadim Knyazev, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Michael P. Kushner, M.B.A., P.M.P.	<i>Lecturer in Engineering Management</i>
William LaPlante, Ph.D.	<i>Lecturer in Mechanical Engineering</i>
Mesfin Lakew, M.S.	<i>Lecturer in Civil Engineering</i>
S. Samuel Lin, Ph.D.	<i>Lecturer in Civil Engineering</i>
Francis Linehan, M.E.E.	<i>Lecturer in Electrical Engineering and Computer Science</i>
George Mattingly, Ph.D.	<i>Adjunct Professor of Mechanical Engineering</i>
John McTyre, M.S.	<i>Lecturer in Civil Engineering</i>
Rocco Mennella	<i>Lecturer in Mechanical Engineering</i>

Patrick Mehl, Ph.D.	<i>Lecturer in Biomedical Engineering</i>
Mamita Nagaraja, Ph.D.	<i>Adjunct Assistant Professor of Mechanical Engineering</i>
William Newnam, M.S.	<i>Lecturer in Engineering Management</i>
Tien Nguyen, Ph.D.	<i>Adjunct Assistant Professor of Electrical Engineering and Computer Science</i>
Tuan Nguyen, Ph.D., P.E.	<i>Adjunct Associate Professor of Mechanical Engineering</i>
Silas C. Nichols, Ph.D.	<i>Lecturer in Civil Engineering</i>
Ken O'Connell, Ph.D., P.E.	<i>Lecturer in Civil Engineering</i>
Neil Palumbo, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Mark Pettinato, M.S.	<i>Lecturer in Biomedical Engineering</i>
Long Phan, Ph.D.	<i>Lecturer in Civil Engineering</i>
Donald Purcell, J.D.	<i>Lecturer in Engineering Management</i>
Sridava Rao, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Kenneth Romney	<i>Lecturer in Mechanical Engineering</i>
Kevin Russo, M.S.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Alfonz Ruth, Ph.D.	<i>Lecturer in Civil Engineering</i>
Lawrence Schuette, Ph.D.	<i>Adjunct Associate Professor of Electrical Engineering and Computer Science</i>
Matthew D. Sermon, M.S.E.	<i>Lecturer in Engineering Management</i>
Hanney Shaban, Ph.D.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Jeffrey W. Shupp, M.D.	<i>Adjunct Assistant Professor of Biomedical Engineering</i>
Randy Swisher, M.S.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Richard C. Thompson, Jr., Ph.D., M.B.A., A.I.A.	<i>Lecturer in Engineering Management</i>
Tongele N. Tongele, Ph.D.	<i>Adjunct Assistant Professor in Mechanical Engineering</i>
Nellore Venkataraman, Ph.D.	<i>Lecturer in Mechanical Engineering</i>
Khanh Vu, M.S.	<i>Lecturer in Electrical Engineering and Computer Science</i>
Adam Wolfe, Ph.D., P.E.	<i>Adjunct Assistant Professor of Mechanical Engineering</i>
Bing Xu, Ph.D.	<i>Lecturer in Civil Engineering</i>
Abdulkadir Yavuz, Ph.D.	<i>Adjunct Assistant Professor of Mechanical Engineering</i>
Tse-Fou Zien, Ph.D.	<i>Adjunct Professor of Mechanical Engineering</i>

Biomedical Engineering Advisory Council

Barbara Bregman, Ph.D.	<i>Professor, Georgetown University, Department of Neuroscience, Washington, DC</i>
Kevin Cleary, Ph.D.	<i>Technical Director, Bioengineering Initiative, The Sheikh Zayed Institute for Pediatric Surgical Innovation, Children's National Health System, Washington, DC</i>
Diane L. Damiano, Ph.D.	<i>Chief, Functional & Applied Biomechanics Section, NIH, Bethesda, MD</i>
Joseph Hidler, Ph.D.	<i>Chief Operating Officer, Aretch LLC, Ashburn, VA</i>
Corinna Lathan, Ph.D.	<i>President, Anthrotronix Inc., Silver Spring, MD</i>
Joel B. Myklebust, Ph.D.	<i>Deputy Director, Office of Science & Engineering Laboratories, FDA, Silver Spring, MD</i>

Civil Engineering Advisory Council

Dr. Timothy W. Kao, P.E.	<i>Professor Emeritus of Civil Engineering and Former Chair, Department of Civil Engineering, The Catholic University of America, Washington, DC</i>
Mr. Lawrence E. Moore, II, P.E.	<i>Director of Engineering, Clark Concrete Contractors, LLC, Bethesda, MD</i>
Dr. Dennis McCahill	<i>Retired</i>

Dr. Steven Smith	<i>Principal Engineer and Group Manager, CTL Group, Washington Office, Columbia, MD</i>
Ms. Melissa Prelewicz	<i>Associate Executive Director, American Association of Engineering Societies, Reston, VA</i>
Mr. Bill Whiting	<i>Vice President, Whiting-Turner Contracting Co., Washington, DC</i>
Mr. Scott Stewart	<i>Principal, SK&A Structural Engineers, Washington, DC</i>

Electrical Engineering and Computer Science Advisory Council

Ramesh Bharadwaj, Ph.D.	<i>Senior Software Technology Researcher, Naval Research Laboratory, Washington, DC</i>
Thomas E. Bordley, Sc.D.	<i>Distinguished Staff Scientist, General Dynamics Advanced Technology Systems, Washington, DC</i>
Tarek El- Ghazawi, Ph.D.	<i>Professor, IEEE Fellow, Department of Electrical and Computer Engineering, The George Washington University, Washington, DC</i>
Cheng Guan Koay, Ph.D.	<i>Senior Image Data Analyst, Walter Reed National Military Medical Center, Bethesda, MD</i>
Jose R. Latimer, Ph.D.	<i>Business Area Executive for Homeland Protection, Applied Physics Laboratory, Johns Hopkins University, Baltimore, MD</i>
Dunling Li, Ph.D.	<i>Senior Software Engineer, BTS Software Solutions, Columbia, MD</i>
Seong Mun, Ph.D.	<i>Professor and Director, Institute of Advanced Study Virginia Tech, Alexandria, VA</i>
Jude R. Nitsche	<i>Nitsche and Associates LLC, Arlington, VA</i>
Kay Stepper, Ph.D.	<i>Regional Business Unit Leader, Robert Bosch LLC, Plymouth, MI</i>

Mechanical Engineering Advisory Council

Richard Dame, Ph.D.	<i>President (Retired), Mega Engineering, Silver Spring, MD</i>
David Didion, Ph.D.	<i>Retired NIST Fellow, National Institute of Standards and Technology, Port Republic, MD</i>
Terry DuBois, Ph.D.	<i>US Army Communications, Electronics, Research, Development and Engineering Center, Aberdeen Proving Ground, MD</i>
Stan Halperson	<i>Executive Committee Member of ASME, Washington, DC</i>
Peter Herdic, Ph.D.	<i>Naval Research Laboratories, Washington, DC</i>
Don Marlowe	<i>Standards Administrator (Retired), Science and Health Communication, U.S. Food and Drug Administration, Rockville, MD</i>
Jude Nitsche	<i>Nitsche and Associates LLC, Alexandria, VA</i>
Steven Russell, Ph.D.	<i>Project Manager, Ship Systems Engineering Office of Naval Research, Arlington, VA</i>
Jaclyn A. Schade	<i>Registered Patent Agent, Pillsbury Winthrop Shaw Pittman LLP, McLean, VA</i>
Owen G. Thorp, III, Ph.D.	<i>Captain, USNR, Permanent Military Professor Weapons and Systems Engineering Department, US Naval Academy, Annapolis, MD</i>
Stephen Wilson	<i>Deputy Director, Ship Signature Department, NSWC - Carderock, West Bethesda, MD</i>

History

The engineering program was established in 1896, soon after the founding of The Catholic University of America. The School of Engineering was formally established as a separate school in 1930 and was shortly thereafter renamed the School of Engineering and Architecture. In 1992 the School of Engineering and Architecture separated and became the School of Engineering and the School of Architecture and Planning. Prior to 1950, the primary focus of the school was on undergraduate professional programs, although graduate programs had always been offered. However, research activity and graduate professional offerings have increased at a steady rate since 1950. Today the School of Engineering offers bachelor's, master's and doctoral degrees in five

academic programs as well as a master's degree in Engineering Management and Materials Science and Engineering. The school prides itself on being a small Catholic engineering school that provides quality education with a personal touch.

Students can expect close interaction with faculty, small class sizes, a small student-to-teacher ratio and a faculty dedicated to teaching and research. All members of the full-time faculty hold doctoral degrees and are very active in funded research and scholarly publication.

The school's strong ties with local research institutions such as NASA, NIH, NIST, NRL etc., foster research collaborations and enable our faculty to bring research experience into the classroom. Students can benefit from research assistantships from funded research projects.

Goals

As stated in its strategic plan updated in 2012, The Catholic University of America's School of Engineering provides a personalized learning and research environment in which faculty, staff and students achieve excellence in research, education and service. The program emphasizes research and scholarship of the highest caliber and provides personalized instruction at both the graduate and undergraduate levels.

Graduate programs in the school emphasize both theory and application of advanced engineering principles. The goal of the school is to produce professional engineers, scientists and researchers who can contribute significantly to society through their chosen profession and scientific and research activities.

Degree Programs

Through its four departments and two non-departmentalized engineering programs, the school offers graduate programs leading to the Master of Science (M.S.) degree and Doctor of Philosophy (Ph.D.) degree in the following concentration areas:

Biomedical Engineering (M.S., Ph.D.) Civil Engineering (M.S., Ph.D.) Electrical Engineering (M.S., Ph.D.) Computer Science (M.S., Ph.D.) Mechanical Engineering (M.S., Ph.D.) Engineering Management (M.S. only)
Materials Science and Engineering (M.S. only)

The curricula of the master's degree programs aimed at a particular discipline provide in-depth coverage of topics related to the discipline.

Special Regulations Admission

Admission to the School of Engineering follows the general university regulations (see Admission to Graduate Study in these *Announcements*). We present here general admission regulations pertaining only to the graduate degree programs of the School of Engineering. Additional specific requirements for admission to particular programs, if any, are given in the departmental sections. Admission to all graduate degree programs is made by the dean of the School of Engineering upon the recommendation of the chair/director of the appropriate graduate program.

Doctoral Degree Programs

The minimum grade point average, GPA, required for admission to the doctoral degree programs is 3.4. In special circumstances, program chairs and faculty may petition for students to be admitted who do not meet the GPA guideline. There is no provisional admission for the doctoral programs.

Master Degree Programs

The minimum requirement for admission to the M.S. degree program is a baccalaureate degree from an accredited university. The minimum requirement for admission to the master's degree program of a particular engineering program is an undergraduate degree from an accredited engineering program. Additional requirements may apply based on undergraduate performance. The minimum GPA required for regular admission to master's degree programs is 3.0 for bachelors-level courses. Provisional admission may be granted to students with a bachelor's-level GPA less than 3.0. Provisional admission will be converted to regular admission after the student passes a set of approved graduate level courses with a minimum GPA of 3.0.

Degree Requirements

The degree requirements for graduate studies in the School of Engineering generally follow the university requirements (see General Requirements of Graduate Studies). We present here general degree requirements pertaining only to the graduate degree programs of the School of Engineering. Additional specific degree requirements for particular programs, if any, are provided in the departmental sections.

Grade Point Average for Graduation

A minimum cumulative GPA of 3.0 in coursework taken in the School of Engineering is required for graduation in all graduate programs.

Master's Degree

The university's general requirements for graduate study for the master's and licentiate degrees apply to all master's degree programs offered in the School of Engineering. There are, however, two exceptions: competency in a foreign language is not required and a comprehensive examination is not required. The minimum requirements for the master's degree are the successful completion of an approved program of study consisting of at least 30 semester credit hours. Individual programs may require more than 30 semester credit hours. Two options are available to complete the requirements.

Non-thesis Option

A student may complete the required semester credit hours through graduate coursework with a cumulative GPA of at least 3.0.

Thesis Option

A student may write a master's thesis whose topic is approved by the appropriate graduate program. If this option is selected, the student registers for a total of six semester credit hours of master's thesis guidance. Upon approval of the written thesis, six semester credit hours, which count toward the minimum 30, will be posted to the student's academic record. The remaining number of semester credit hours of graduate coursework must be completed with a minimum cumulative GPA of 3.0.

Core Master's-Level Course

All students pursuing a master's degree in the programs of biomedical, civil, electrical and mechanical engineering are required to pass with a grade of C or better in two of the four courses: Graduate Level Applied Mathematics, Numerical Methods in Engineering, Engineering Economics and Engineering Systems Analysis. Each program may impose further restrictions regarding which courses their students must take.

Joint Master's Degree Programs

Some graduate programs in the School of Engineering participate in joint degree programs that allow students to earn two engineering master's degrees. The student must satisfy all requirements for both degrees but may be allowed to designate up to four approved graduate engineering courses to partially satisfy the requirements for both degrees. Typically, this would reduce the total number of graduate engineering courses required to earn both master's degrees from 20 courses to 16 courses. Contact the dean's office of the School of Engineering for more information.

Doctoral Degree

The university's general requirements for graduate study for the doctoral degree apply to all doctoral programs of the School of Engineering, with one exception: the foreign language competency exam is not required. The requirements for a doctoral degree (Ph.D.) of the school include:

1. A minimum of 53 semester hours of graduate work in a program of study prepared and approved in consultation with an advisor;
2. The successful passing of a comprehensive examination upon completion of the graduate coursework;
3. The approval of a dissertation proposal submitted and presented by the candidate; and
4. The approval and successful defense of the dissertation in an oral examination conducted as specified by university procedures.

Transfer of Credit

Up to six semester credit hours of graduate work earned at another accredited institution with a grade of B or higher may be applied toward course requirements for master's degrees upon recommendation of the appropriate graduate program and with the approval of the dean of the school. Up to 24 semester credit hours of graduate work earned at another accredited institution with a grade of B or higher may be applied toward course requirements for the doctoral degrees upon recommendation of the appropriate graduate program and with the approval of the dean of the school. As part of the 24 credits eligible for transfer, up to six credits of thesis coursework may be eligible for transfer. The thesis work and topic are subject to review by the department chairperson and the transfer must be approved by both the department chairperson and dean. For students who earned their master's degrees at CUA, up to 30 semester credit hours of coursework with a grade of B or above may be applied toward the course requirements for the doctoral degrees.

General Engineering

Courses Offered

A full listing of general engineering graduate courses offered by the School of Engineering is found below. Additional courses can be found in each of the following departmental sections. Consult [Cardinal Station](#) for additional information about courses and to determine course offerings by semester.

Department of Biomedical Engineering

Associate Professors	Sang Wook Lee; Peter Lum, <i>Chair</i> ; Binh Tran; Otto Wilson, Jr.
Assistant Professors	Gregory Behrmann; Sahana Kukke, Christopher Raub
Lecturers	Kenneth A. Byrd; Christy Foreman, Patrick Mehl; Mark Pettinato
Adjunct Assistant Professors	Isaac Chang; Jeffrey Shupp
Research Ordinary Professor	Harold Szu

The Department of Biomedical Engineering offers graduate programs leading to the degrees of Master of Science in Biomedical Engineering, and Doctor of Philosophy, Ph.D. The focus of graduate education is to provide biomedical engineers with the principles and tools of modern engineering, applied to solving problems in medicine or biology.

Courses are offered in the following areas of concentration: Biomaterials and Biotechnology
Biomechanics & Rehabilitation Engineering Biomedical Instrumentation & Medical Imaging Home Care Technologies & Telemedicine Clinical Engineering

The Biomedical Engineering Program has strong interaction with the Department of Mechanical Engineering and the Department of Electrical Engineering and Computer Science in terms of course offerings and research activities. Graduate students may follow one of two tracks-thesis or coursework designed for two distinct groups of students. The first track offers both master's and doctoral programs and is directed at those students pursuing research activities that will culminate in a thesis or dissertation. The coursework requirements are intended to prepare the student for research.

The second track offers only a master's degree program intended for recent graduates, practicing engineers and/or medical professionals interested in specialized areas pertinent to career objectives. These professional degree programs enable the engineer or scientist to become familiar with new developments and advances in technologies. These programs allow flexibility in course selection, including those outside the department.

Qualified CUA undergraduate students are encouraged to pursue graduate studies via the accelerated master's program.

Admission

In addition the school's admissions guidelines (under Special Regulations) for regular admission status to the master's and doctoral degree programs in biomedical engineering, students will be admitted based upon enrollment availability and their ability to meet the following recommended entrance requirements:

Students must have received a bachelor's degree in engineering, science or mathematics from an accredited institution and, in addition must satisfy:

All minimum university requirements

A cumulative undergraduate GPA of at least a 3.0 out of 4.0 (master's) or 3.4 out of 4.0 (doctoral)

Students not meeting the above minimum requirements may receive provisional admission (master's only) as recommended by the graduate committee and/or department chair. Performance of provisional students will be reviewed after one semester of graduate study for transfer to regular admission status.

Students from non-engineering disciplines may be required to take prerequisite courses (e.g., statics, dynamics, electrical circuits, differential equations, fluid mechanics, etc.), as appropriate.

Master's Degree

Graduate students plan their program in consultation with an advisor and may elect to pursue a broad master's degree program without specific concentration or to major in one of the areas identified above. Maximum flexibility in scope of studies is afforded by utilization of courses offered in other departments of the university or other local universities through the Consortium of Universities of the Washington Metropolitan Area.

Requirements for the master's degree programs follow those established for the school. Please refer to Degree Requirements.

Doctoral Degree

Requirements for the doctoral degree program follow those established for the school. Please refer to Degree Requirements.

Typical Courses Offered

Please consult the registrar's Web site at <https://cardinalstation.cua.edu> for descriptions of courses offered in the current semester.

Courses Offered

A full listing of graduate courses offered by the department is found below. Consult **Cardinal Station** for additional information about courses and to determine course offerings by semester.

Department of Civil Engineering

Professor	Lu Sun, Chair
Professors Emeriti	John J. Baltrukonis; Timothy Kao; Dennis F. McCahill; John J. McCoy; Hsien Ping 'Frank' Pao; Michael C. Soteriades
Associate Professor	Gunnar Lucko; Arash Massoudieh
Assistant Professors	Bismark Agbelie; Chanseok Jeong; Min 'Max' Liu; Masataka Okutsu,
Lecturers	Mostafa K. Ardakani, Hoda Azari, Abdollah Bagheri, John Bonita, Yekai Chen, Xin Chen, Yingwu Fang, Reza Farahani, Joseph Findaro, Wenjun Gu, Sung-Hwan Jang, Zhen-Gang Ji, Charbel N. Khoury, Xuan (Sean) Kong, Mesfin Lakew, Samuel Lin, John McTyre, Gummada Murthy, Long T. Phan, Brian Pietryka, Alfonz Ruth, Haijian Shi, Nazy Sohbi, Serena Stafford, Stephen Sullivan, Richard Thompson, Jr., Ru Tian, Thomas Weaver, Feng Xie, Bing Xu, Wei Xu, Qiu Zhao

The goal of the educational programs in civil engineering is to produce graduates who are schooled in engineering fundamentals and capable of doing advanced engineering work. To this end, programs offered in the Department of Civil Engineering are professional in nature and lead to the Master of Science degree, and the Doctor of Philosophy, Ph.D. Major areas include fluid and solid mechanics, structures and structural mechanics, geotechnical engineering, environmental engineering and management, systems engineering, transportation engineering, and construction engineering and management. The available courses include laboratory studies, applied mathematics, engineering analysis, engineering design and a variety of introductory and advanced level courses in various areas of engineering and applied science and construction management. The department also participates in an interdisciplinary graduate program in engineering management leading to the Master of Science, M.S. degree.

Admission

Please refer to Admission under Special Regulations for the school.

Master's Degree

Graduate students plan their program in consultation with an advisor and may elect to pursue a broad Master of Science (M.S.) degree program major in one of the areas identified above. The minimum requirements for the master's programs in civil engineering are the successful completion of 30 semester credit hours. Maximum flexibility scope of studies is afforded by utilization of courses offered in departments of the university or other area universities through the Consortium of Universities of the Washington Metropolitan Area.

Doctoral Degree Programs

Candidates for the Ph.D. degree in civil engineering plan their program in consultation with an advisor. The program of studies is tailored individually to meet the needs of the student and the academic and professional standards of the department. Maximum flexibility in scope studies is afforded by utilization of courses offered in other departments of the university or other area universities through the Consortium of Universities of the Washington Metropolitan Area.

Other requirements for the doctoral degree program follow those established for the school. Please refer to Degree Requirements.

For students interested in pursuing a Ph.D. degree, a Master's thesis is strongly recommended.

Courses Offered

A full listing of graduate courses offered by the department is found below. Consult **Cardinal Station** for additional information about courses and to determine course offerings by semester.

Engineering Management Program

Adjunct Associate Professors:	Alan B. Carr; Jeffrey E. Fernandez; Larry D. Ferreiro; Jeffrey E. Giangliuli, <i>Director</i> ; Boyd A. Jones; Michael P. Kushner; William Newnam; Donald Purcell; Matthew D. Sermon; Richard C. Thompson, Jr.
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Mission

The Engineering Management Program offers students the opportunity to earn a Certificate in Engineering Management or a Master of Science degree. The Engineering Management Program curriculum enhances management performance, develops managerial skills, and promotes the use of technology and engineering techniques to resolve the production, operations, regulatory, and financial issues facing today's professional in business, industry and government. It is designed to provide the student with knowledge of the theory and practice of management as it specifically pertains to engineering and technology-oriented organizations and activities. The program is oriented to the management of engineering processes within the broader context of a company or agency enterprise.

Master of Science (Engineering Management)

The Master of Science curriculum enhances management performance and develops managerial skills. It is designed to provide the student with knowledge of the theory and practice of management as it specifically pertains to engineering and technology-oriented organizations and activities. The program is oriented to the management of engineering processes within the boarder context of a company or agency enterprise. Three tracks are offered to allow the student to focus on their career preference:

Engineering Management and Organization

This track was developed to provide a graduate-level foundation for the practice of managing engineering organizations. It is appropriate for those that will assume leadership positions in technically oriented organizations.

Project and Systems Engineering Management

This track was developed to provide a graduate level foundation for the practice of managing projects associated with development and life cycle management of a product. It is appropriate for project managers and system engineers in management roles or those that will be in those positions.

Technology Management

This track was developed to provide a graduate-level foundation for the practice of managing technology development, and implementation of sustainment activities. It is appropriate for those that will assume leadership positions in technology development or sustainment organizations.

Each track has seven core courses that give the foundation for engineering management and electives that allow students to focus their degree to their personal career plan. Nine semester hours (three courses) are used to tailor the degree program to the student's specific needs.

The Master of Science (Engineering Management) degree program requires completion of 30 semester credit hours. The School of Engineering offers a wide range of specialties relating to mechanical engineering, civil engineering, electrical engineering, computer science, and biomedical engineering. Elective courses up to six credits may be transferred from accredited educational institutions into the program. Our partnership with the Nuclear Power Directorate allows transfer of 12 credits for completion of the U.S. Navy Officer Nuclear Power School Program.

A maximum of 6 credit hours of studies may be transferred from another institution. No course with a grade of less than B (3.0) is transferrable. Grades earned in transferred courses are not included in computing the required GPA of 3.0. Up to 9 credit hours may be transferred from the Defense Acquisition University (DAU). Specific restrictions are addressed on the DAU Partnership page.

Other substitutes may be appropriate depending on the student's educational objectives.

The Engineering Management master's degree program results in an engineering/scientific degree, rather than a business degree; therefore the program candidate should have an engineering, physical science or mathematics degree with appropriate technical or engineering experience. (Depending on experience, candidates without mathematics-based degree may be accepted for the program. Prerequisites may be required.)

A minimum of 30 semester credit hours is required, but a thesis is not required. All M.S. candidates for graduation must have earned at least a 3.0 cumulative grade point average in courses leading to the degree. For more information go to <http://engineering.cua.edu/engrmgmt>.

Certificate of Engineering Management

Four Professional Certificates are available:

Engineering Management Professional Certificate

This program is designed to provide specialized graduate-level education and to further professional continuing education for those persons who will assume major administrative positions in industry or government organizations.

Program Management Professional Certificate

This program is designed to provide specialized graduate-level education and to further professional continuing education or certification (beyond or prior to Project Management Institute certification) for those who will act as program or product managers in industry and government.

Systems Engineering Professional Certificate

This program is designed to provide specialized graduate-level education and to further professional continuing education or certification (beyond or prior to International Council on Systems Engineering (INCOSE) certification) for those persons who will act as the technical/systems engineering lead in major programs, organizations or functions in industry or government.

Management of Information Technology Professional Certificate

This program is designed to provide specialized graduate-level education and to further professional continuing education or certification for those persons who will be responsible for management of information technology resources in industry and government.

These certificate programs provide an understanding of the core engineering management theory and tools that underpin technical management practices.

The Engineering Management Professional Certificate is awarded upon successful completion of 15 semester credit hours (five courses) of key program courses. To meet student needs one course could be substituted by an appropriate elective course from the School of Engineering or an approved transferred course.

For a course to be transferred, students must have earned a grade of B or better. The certificate is awarded after completion with a grade of C or better in all courses counted toward the certificate requirements.

Courses Offered

A full listing of graduate courses offered by the department is found below. Consult [Cardinal Station](#) for additional information about courses and to determine course offerings by semester.

Class Locations

Engineering Management classes are held at the Crystal City Crowne Plaza Hotel or on the CUA campus in northeast DC. The degrees offered at off campus sites have been approved by the governing board of CUA and are equivalent to those given on campus. The State Council of Higher Education for Virginia (SCHEV) has certified the CUA School of Engineering to operate in Virginia.

Department of Electrical Engineering and Computer Science

Professors	Nader Namazi; Charles C. Nguyen; Philip A. Regalia
Professors Emeriti	Andrew G. Favret; George E. McDuffie; Robert Meister
Associate Professors	Lin-Ching Chang; Ozlem Kilic, <i>Chair</i> ; Hang Liu; Erion Plaku
Assistant Professors	George Nehmetallah; Patricio Simari
Clinical Assistant Professors	Ujjal Bhowmik
Lecturers	Charles Campbell Jr.; Vincent Cassella; Aysegul Cuhadar; Vinh Dang; Saïid Ganjalzadeh; Robert Kamocsai; Vadim Knyazev; Francis Linehan; Quang Nguyen; Sridava Rao; Kevin Russo; Lawrence Schuette; Hanney Shaban; Randy Swisher; David Tremper

The Department of Electrical Engineering and Computer Science offers graduate programs leading to the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.). Programs offered are Computer Graphics, Computer Engineering, Communication Systems, Network Security, Sensors and Remote Sensing, Microwave, Optics and Materials, and Signal and Image Processing.

The faculty is actively engaged in several research areas including computer graphic display of medical images, Web-based communication, ATM-based high-speed networks, computer and satellite communications, interaction of electromagnetic radiation with biological systems, image microoptical devices, image motion detection and estimation, communication intelligence, information visualization, biomedical imaging, computational intelligence and image understanding. A majority of the research projects is funded by industries and government agencies such as NASA, the Navy, the Army, the NIH, and NSF.

Admission

Students pursuing degree programs should apply for regular admission. The minimum requirement for regular admission to the M.S. program is a bachelor's degree in engineering, science or mathematics from an accredited institution. Students lacking certain requirements for regular admission to the M.S. program can apply for a provisional admission.

Performance of provisional students will be reviewed after two semesters of graduate study for possible transfer to regular admission. The minimum requirements for regular admission to the M.S. program in computer science is a bachelor's degree with undergraduate background in computer science that includes the equivalent of the following topics: data structures, computer organization and assembly language, programming languages, theoretical computer science, and discrete structures. A student will be provisionally admitted to the M.S. program if he or she has one or more deficiencies. The deficiency courses must be successfully completed before the provisional status is converted to regular status. Admission to the doctoral degree programs is based upon academic performance at the bachelor and master's levels. For other admission requirements, please refer to Admission under Special Regulations.

M.S. Program

Two options are available in the M.S. program. The non-thesis option requires 30 semester credit hours of approved coursework. The thesis option requires a minimum of 24 semester credit hours of approved coursework plus a thesis comprising six semester credit hours of master's thesis guidance. The approved coursework must include at least 18 semester credit hours of approved electrical engineering courses. The remaining courses must be in engineering and science disciplines and approved by the graduate coordinator of the department.

The M.S. degree program in computer science has two options, the thesis option and the non-thesis option. For both options, each student must submit a program of study to the department for approval upon entering the program. The program of study must contain a minimum of 30 semester credit hours of approved graduate-level courses comprising at least 18 semester credit hours of core courses and 12 semester credit hours of elective courses.

The core courses must be selected from courses in four areas of concentration: computer science foundations, computer systems, software systems, and computing methodologies, such that at least three semester credit hours are chosen from each of the above areas of concentration.

Doctoral Degree Program

The program of studies is individually tailored to meet the needs of the student and to fit with the department research areas and facilities. Students must pass a comprehensive examination in major and minor areas after completing all required coursework.

The Ph.D. degree requires a minimum of 54 semester hours of formal graduate coursework beyond the bachelor's degree. The major includes at least nine semester credit hours and minor includes at least six credit hours at the graduate levels in one of the listed topic areas. Additional areas that must meet minimum requirements are chosen in consultation with the advisor. For additional degree requirements, see Degree Requirements.

Courses Offered

A full listing of graduate courses offered by the department is found below. Consult [Cardinal Station](#) for additional information about courses and to determine course offerings by semester.

Materials Science and Engineering

Associate Professors	Biprodas Dutta, <i>Director</i> ; John Philip; Abhijit Sarkar
Research Ordinary Professors	Lawrence Cook
Clinical Associate Professors	Jandro Abot
Adjunct Assistant Professors	Sugata Chowdhury
Lecturers	Mrinal Dewanjee; Parshu Gyawali

The Materials Science and Engineering (MSE) program offers graduate courses leading to the degree of Master of Science, M.S. Two options are available in the M.S. program. The non-thesis option requires 30 semester credit hours of approved coursework. The thesis option requires a minimum of 24 semester credit hours of approved coursework plus a thesis comprising six semester credit hours of master's thesis guidance.

The approved coursework must include at least 18 semester credit hours of approved MSE core courses. The core courses are described in a later section. The remaining courses must be in engineering and science disciplines and approved by the director of the program. For both options, each student must submit a program of study to the program director for approval upon entering the program.

Mission

The goal of the MS program in MSE is to produce graduates who are schooled in engineering fundamentals and capable of doing advanced engineering work. To this end, the Materials Science & Engineering program is professional in nature and lead to the Master of Science degree. Major areas include metal, ceramics, glasses, physical, mechanical, structural and electrical properties of materials. Other areas of specialization are nanotechnology, lasers and semiconductor lithography. The available courses include laboratory studies, applied mathematics, engineering analysis and a variety of introductory and advanced level courses in various areas of engineering and applied science. Graduate students plan their program in consultation with the program director and pursue the Master of Science (M.S.) degree program with a specific concentration in one of the areas identified above. Maximum flexibility scope of studies is afforded by utilization of courses offered in departments of the university or other area universities through the Consortium of Universities of the Washington Metropolitan Area.

Admission

Students pursuing the MS degree in MSE should apply for regular admission. The minimum requirement for regular admission to the M.S. program is a bachelor's degree in engineering, science or mathematics from an accredited institution. For foreign students, satisfactory scores (according to CUA guidelines) in TOEFL or a similar testing agency is additionally required. Students lacking certain requirements for regular admission to the M.S. program can apply for a provisional admission. Performance of provisional students will be reviewed after two semesters of graduate study for possible transfer to regular admission. The minimum requirement for regular admission to the M.S. program in MSE is a bachelor's degree with undergraduate background in engineering, computer science, any science discipline including biology and mathematics. A student will be provisionally admitted to the M.S. program if he or she has one or more deficiencies. The deficiency courses must be successfully completed before the provisional status is converted to regular status. For other admission requirements, please refer to Admission under Special Regulations.

Courses Offered

A full listing of graduate courses offered by the department is found below. Consult [Cardinal Station](#) for additional information about courses and to determine course offerings by semester.

Special Topics Courses

Computational Materials Science, Transport Phenomena, Fracture and Fatigue, Welding and Joining Processes, Systems Perspectives on Industrial Ecology, Sustainable Energy: Economic and Environmental Issues, Engineering Risk- Benefit Analysis, Symmetry and Tensor Properties of Materials are some of the courses that are not listed in the table above but will be offered as "Special Topic" courses from time to time if sufficient student interest is perceived.

Department of Mechanical Engineering

Professors	J. Steven Brown; Sen Nieh, <i>Chair</i> ,
Professors Emeriti	Mario J. Casarella; Yun Chow Whang
Adjunct Ordinary Professors	George Mattingly, Tse-Fou Zien
Associate Professors	John A. Judge; Joseph Vignola; Zhaoyang Wang
Clinical Associate Professors	Jandro Abot
Adjunct Associate Professors	Tuan Nguyen
Assistant Professors	Eric Kommer; Xiaolong Luo
Clinical Assistant Professors	Diego Turo
Adjunct Assistant Professors	Mamta Nagaraja; Tongele N. Tongele; Adam Wolfe
Lecturers	Jeffrey Didion; Shane Guan; William LaPlante; Rocco Mennella; Kenneth Romney; Nellore Venkataraman

The Department of Mechanical Engineering offers graduate programs leading to the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.). The programs are:

Professional Master's Program

For recent graduates and practicing engineers interested in specialized areas to enhance their careers, the program emphasizes advances in existing and emerging technologies. Master's thesis is optional.

Master's Program (pre-doctoral)

For students interested in pursuing a Ph.D. degree, a Master's thesis is strongly recommended.

Doctoral Program

For students pursuing a Ph.D. degree, this program emphasizes strong foundations in mechanical engineering as well as advanced topics in a specialized area of concentration.

Research Areas

- Acoustics
- Active Control and Intelligent Materials/Systems
- Advanced and Non-Linear Dynamics
- Aerospace and Aeronautic Engineering
- Air Pollution Control and Indoor Air Quality
- Biofabrication & Microfluidics
- Clean Energy Power Production and Use
- Combustion and Multiphase Systems
- Composite Materials
- Computational Methods (FEM and CFD)
- Electronic Packaging and 3-D Imaging
- Heat/Mass Transfer and Thermodynamics
- HVAC and Refrigeration
- Lab-On-A-Chip Mechatronics and MEMS
- Nano-Mechanics and Sensors
- Robotic Mechanics
- Structural and Experimental Mechanics
- Three-Dimensional Imaging
- Vibration and Noise Reduction of Mechanical Systems

Admission

Please refer to Admission under Special Regulations.

Master's Degree Program

Candidates for graduate studies plan their program in consultation with an advisor. Maximum flexibility in scope of studies is afforded by utilization of courses offered in other departments of the university or other area universities through the Consortium of Universities of the Washington Metropolitan Area. Requirements for the master's degree programs follow those established for the school with the specification of ENGR 520 (Mathematical Analysis for Graduate Students) and one of the following two courses, ENGR 516 (Computational Methods for Graduate Students) or ENGR 518 (Experimental Techniques for Graduate Students). The department offers the following areas of specialty: 1) Energy and Environment, 2) Acoustics, Vibration and Structures and 3) Nano-mechanics and MEMS. Please refer to Degree Requirements.

Doctoral Degree Program

Requirements for the doctoral degree program follow those established for the school. Please refer to Degree Requirements. Note that the comprehensive examination is directed at assessing a student's preparation in advanced topics for doctoral research, and understanding of the research literature and a student's ability to define the frontiers of the proposed areas of investigation. The department offers two areas of specialty for doctoral study: 1) Thermal-Fluid Sciences, and 2) Mechanics, Acoustical and Nano Systems.

Courses Offered

A full listing of graduate courses offered by the department is found below. Consult [Cardinal Station](#) for additional information about courses and to determine course offerings by semester.

BE	501	Biomaterials
BE	502	Advanced Biomechanics
BE	504	Biomechanics of Hard Tissue
BE	506	Mechanics of Soft Tissue
BE	508	Biomedical Applications of Origami
BE	513	Biomedical Instrumentation I
BE	514	Introduction to Biomedical Optics

BE	515	Biomedical Signal Processing
BE	516	Bioelectromagnetics
BE	518	Biomedical Sensors
BE	520	Medical Robotics
BE	521	Neural Control of Movement
BE	522	Human Locomotion
BE	523	Biomechanical Assessment of Locomotion Disorders
BE	524	Prosthetics & Orthotics
BE	525	Biomedical Heat and Mass Transfer
BE	526	Biomedical Transfer Processes
BE	527	Cell and Tissue Engineering
BE	528	Rehabilitation Engineering
BE	529	Clinical Engineering Facilities & Regulatory
BE	530	Human Computer Interfaces
BE	531	Neural Stimulation in Rehabilitation
BE	532	Sensory Motor Integration
BE	533	Human Factors Engineering and Ergonomics
BE	534	Experimental techniques in motor neuroscience
BE	535	Optimization of Human Performance
BE	536	Mechanics of Dance and Sports
BE	540	Home Care Technologies Seminar
BE	541	Home Care Technologies I: Foundations
BE	542	Home Care Technologies II:Product Evaluation
BE	543	Home Care Technologies III: Product Design and Manufacturing
BE	544	Innovations in Healthcare Service Delivery
BE	546	Medical Device Design and Regulation
BE	548	Medical Reliability Engineering
BE	550	Nano-Medicine
BE	552	Biotechnology & Biomedicine
BE	554	Bioinformatics
BE	556	BONE
BE	558	Biomedical Engineering Innovation and Entrepreneurship
BE	560	Computational Models of Complex Biomedical Systems
BE	581	Medical Imaging
BE	582	Medical Image Processing
BE	586	Ultrasound Imaging & Therapy
BE	595	BMED Grad Internship Projects
BE	597	Biomedical Research Methods
BE	613	Advanced Topics in Medical Instrumentation
BE	617	Soft Computing-BioMonitoring and Bio-Control
BE	621	Advanced Topics in Neural Control
BE	651	Computations in Genetic Engineering
BE	671	Cardio-Pulmonary Biomechanics

BE	681	Advanced Topics in Optical Imaging
BE	683	Principles and Biomedical Applications of Fluorescence
BE	721	Advanced Neuro-Mechanical Modeling
BE	728	Advanced Topics in Rehabilitation Engineering
BE	729	Advanced Topics in Biomaterials
BE	733	Mathematical Modeling in Biology
BE	734	Molecular Dynamics and Simulation
BE	797	Special Topics in Biomedical Engineering
CE	501	Advanced Mechanics of Solids
CE	502	Introduction to Continuum Mechanics
CE	503	Introduction to Elasticity
CE	504	Stress-Strain Behavior of Soils
CE	506	Advanced Structural Systems
CE	511	Applied Plastic Design and Limit Analysis
CE	514	Advanced Vibrations and Structural Dynamics
CE	516	Prestressed Concrete
CE	517	Infrastructure Evaluation and Service Life Extension
CE	518	Experimental Techniques for Graduate Students
CE	524	Matrix and Computer Methods in Structural Analysis
CE	525	Nondestructive Evaluation and Condition Assessment of Structures
CE	526	Introduction to Finite Elements
CE	529	Computational Fluid Mechanics
CE	534	Disaster - Mitigating Design
CE	538	Introduction to Environmental Engineering
CE	538	Environmental Engineering
CE	541	Environmental Engineering Chemistry
CE	542	Environmental Chemistry Laboratory
CE	543	Environmental Microbiology & Biological Processes
CE	555	Environmental Law and Policy
CE	556	Sustainable Development Principles and Practice
CE	560	Case Studies in Geotechnical and Geo-environmental Engineering
CE	562	Seepage and Slope Stability
CE	563	Applied Hydrology
CE	564	Surface Water Quality
CE	565	Water Resources Engineering
CE	570	Pavement Management System
CE	571	Pavement Theory & Design
CE	572	Intelligent Transportation Systems
CE	573	Traffic Engineering and Flow Theory
CE	574	Forensic Engineering-Scientific Failure Investigation
CE	575	Introduction to Systems Analysis
CE	576	Systems Design
CE	577	Econometrics

CE	578	Transportation Systems Management and Operations
CE	579	Harbors and Coastal Engineering
CE	581	Practical Construction Law
CE	582	Value Engineering
CE	583	Engineering Entrepreneurship, Sustainability, and Lean Methods
CE	585	Graduate Research Methods
CE	586	Advanced Cementitious Material
CE	587	Estimating and Bidding
CE	588	Construction Operational Management
CE	589	Construction Scheduling Techniques
CE	590	Construction Operational Analysis
CE	591	Engineering Hydrogeology and Groundwater Flow
CE	594	Construction Law, Operations and Project Delivery
CE	596	Water and Wastewater Treatment Engineering
CE	598	Hazardous Waste Treatment
CE	599	Transportation Safety Engineering
CE	603	Inelastic Stress Analysis
CE	604	Constitutive Modeling of Frictional Materials
CE	611	Management Information Systems and GIS in Civil Engineering
CE	614	Earthquake Engineering and Seismic Design
CE	615	Soil Dynamics and Geotechnical Earthquake Engineering
CE	622	Variational Methods in Engineering
CE	630	Pavement Theory and Design Principles
CE	670	Risk and Reliability in CE Systems
CE	675	Advanced Operations Research
CE	714	Passive and Active Control of Large Structural Systems
CE	732	Theoretical Hydrodynamics
CE	767	Advanced Geotechnical and Structural Systems
CENT	503	Reinforced Concrete Design
CENT	506	Advanced Structural Systems
CENT	508	Bridge Inspection
CENT	509	Geosynthetics in Civil Engineering
CENT	513	Pavement Asset Management
CENT	525	Nondestructive Testing and Evaluation
CENT	542	Web Design and Programming
CENT	550	Computer Programming & Appl.
CENT	551	Project Management
CENT	552	Decision Analysis
CENT	553	Risk Management
CENT	554	Organization Theory & Behavior
CENT	566	Geotechnical Engineering & Lab
CENT	568	Foundation Engineering
CENT	570	Pavement Management System

CENT	573	Traffic Flow Theory & Engineering
CENT	575	Introduction to System Analysis
CENT	578	Transportation Systems Management and Operations
CENT	601	Human Resource Management
CENT	611	Geographical Information System
CENT	651	Selected Imaging Techniques in Civil and Transportation Engineering
CNGW	743	ENCE: Soil Dynamics and Earthquake Engineer
CNMD	529	0102: ARSC 101
CNMD	530	ENAE 692:Introduction to Space Robotics
CNMD	743	ENCE: Soil Dynamics and Earthquake Engr
CNMD	789A	GEOL: Seismology
CEE	515	Digital Signal Processing
CEE	524	Intro to Digital Signal Proces
CEE	527	Neural Networks
CEE	548	Theo& Design- Synchronous Machines
CEE	549	Optoelectronics
CEE	561	Random Signal Theory
CEE	566	Computer Control Systems
CEE	644	Optical Communications
CSC	502	Engineering and Computer Science Management
CSC	504	Compiler Construction
CSC	507	Unix System Programming
CSC	508	X Window Programming
CSC	509	Web Design &Programming
CSC	511	Computational Complexity
CSC	513	Fundamentals of Computer Graphics
CSC	514	Introduction to Hardware Accelerated Computing
CSC	515	Mobile Programming
CSC	519	Digital System Design
CSC	520	Topics in Computer Science
CSC	521	Programmable Logic Devices and HDL Design
CSC	522	Operating Systems
CSC	524	Secure Programming
CSC	525	Embedded Systems Programming
CSC	526	Computer and Network Security
CSC	527	Fundamentals of Neural Networks
CSC	530	Introduction to Data Analysis
CSC	531	Data Communications Networks
CSC	532	System Simulation
CSC	533	Optimization
CSC	534	Communication and Computer Network Simulation
CSC	541	Database Systems
CSC	542	Artificial Intelligence

CSC	551	Pattern Recognition
CSC	564	Advanced Software Engineering
CSC	565	Information Security
CSC	569	Computer Security and Privacy
CSC	575	Human-Computer Interface
CSC	576	Introduction to Robotics
CSC	581	Cryptography and Steganography
CSC	582	Computer Graphics and Game Programming
CSC	583	Geometry Processing in Computer Graphics and Vision
CSC	584	Introduction to Machine Learning
CSC	593	Directed Study
CSC	597	Computer Security & Privacy
CSC	611	Logic for Computing Scientists
CSC	612	Analysis of Algorithms
CSC	613	Combinatorial Algorithms and Intractability
CSC	620	Digital Forensics Technology
CSC	621	Computer Networks
CSC	623	Real-Time Systems
CSC	633	Software Requirements & Specifications
CSC	635	Software Verification, Validation, and Testing
CSC	636	Distributed Computing
CSC	641	Data Mining
CSC	650	Intelligent Multimedia
CSC	651	Multimedia Processing and Information Retrieval
CSC	671	Cyber-Security Laws, Ethics and Policies
CSC	675	Visual Intelligence and Computer Vision
CSC	681	Security Architecture and Analysis
CSC	691	Advanced Computer Architecture
CSC	693	Advanced Topics in Cyber Security
CSC	728	Visualization
CSC	775	Human-Computer Interface
CSC	991	Graduate Design
EE	502	Optical Systems and Devices
EE	504	Introduction to Fourier Optics
EE	514	Introduction to Hardware Accelerated Computing
EE	515	Advanced Digital Signal Processing
EE	516	Power Systems
EE	519	Digital System Design
EE	521	Programmable Logic Devices and HDL Design
EE	522	Linear System Analysis
EE	524	Secure Programming
EE	526	Computer and Network Security
EE	527	Fundamentals of Neural Networks

EE	530	Parallel and Heterogeneous Computing
EE	531	Data Communications Networks
EE	534	Communication and Computer Network Simulation
EE	540	Introduction to Antenna Systems
EE	541	Electromagnetic Theory
EE	542	Antennas and Propagation for Wireless Communications
EE	543	Intro to Remote Sensing and Imaging Applications
EE	544	RF and Microwave Circuits
EE	545	Basics of Computational Electromagnetics
EE	546	Electrical Properties of Materials
EE	548	Optical Signal and Image Processing
EE	549	Parallel Programming for large-scale Computational Problems
EE	550	Semiconductor Optoelectronics - Materials and Devices
EE	561	Random Signal Theory
EE	563	Fundamentals of Acoustics
EE	565	Information Security
EE	569	Computer Security and Privacy
EE	572	Basics of Information Coding and Transmission
EE	576	Introduction to Robotics
EE	581	Cryptography and Steganography
EE	617	Adaptive Signal Processing
EE	618	Optimum Signal Processing
EE	621	Fundamentals of Kalman Filtering and Smoothing
EE	625	System Optimization
EE	627	Neural Networks and Bioinformatics
EE	628	Computational and Molecular Imaging
EE	631	Broadband Integrated Services Digital Networks
EE	634	Digital Image Processing
EE	642	Electro-Optics and Photonics
EE	643	Photonic Communication Network Devices
EE	644	Optical Communications
EE	645	Optical Communication Networks
EE	646	Optical Internet
EE	647	Intelligent Broadband Multimedia Networks
EE	652	Wireless Communications
EE	656	Digital Communications
EE	657	Spread Spectrum Communications
EE	659	Satellite Communications
EE	671	Statistical Signal Processing
EE	672	Error Control Coding
EE	710	Wavelet Theory and Applications
EE	712	Communication Theory
EE	717	Advances in Adaptive Signal Processing

EE	725	Information Theory and Source Coding
EE	731	Computer Communication Networks
EE	740	Numerical Methods in Electromagnetics
EE	741	Advanced Electromagnetic Scattering Phenomena
EE	742	Time Domain Electromagnetics
EE	746	Electromagnetic Radiation and Scattering
EE	771	Detection and Estimation Theory
EE	772	Detection and Estimation Theory II
MSE	501	Introduction to Materials Engineering
MSE	511	Optical and Magnetic Materials: Properties and Synthesis
MSE	519	Experimental Methods in Materials Engineering
MSE	522	Mechanical Properties of Materials
MSE	531	Introduction to Soft Materials
MSE	532	Computational Materials Science
MSE	542	Electrical Properties of Materials
MSE	550	X-ray Diffraction and Electron Microscopy
MSE	551	Physical Properties of Materials
MSE	562	Corrosion Engineering
MSE	571	Artificial Organ Engineering
MSE	581	Introduction to Nanotechnology
MSE	582	Modeling in Materials Science and Engineering
MSE	582	Industrial Processing of Materials
MSE	590	Glass Science
MSE	591	Composite Materials
CCE	505	Decision Analysis
CCE	546	Manag Engr Econ
CCE	547	Managerial Engineering Economics
CCE	570	Project Management
CCE	575	Introduction to Systems Analysis
CMGT	505	Decision Analysis
CMGT	508	Technology Management
CMGT	510	Information Systems for Managers
CMGT	515	Software Project Management
CMGT	547	Managerial Engineering Economics
CMGT	561	Engineering Ergonomics
CMGT	562	Engineering Risk Management
CMGT	570	Project Management
CMGT	572	Organizational Theory and Behavior
CMGT	573	Planning and Control of Organizations
CMGT	574	Strategic Management
CMGT	575	Introduction to Systems Analysis
CMGT	580	Introduction to Systems Engineering Management
CMGT	582	Planning and Control of Organization

ENGR	501	Introduction to Mechatronics
ENGR	503	Control Systems
ENGR	504	Modern Control Systems
ENGR	506	Basic System Design of Space Payloads
ENGR	507	Testing & Data Analysis of Space Payloads
ENGR	510	Strategic Standardization
ENGR	516	Computational Methods for Graduate Students
ENGR	518	Experimental Techniques for Graduate Students
ENGR	520	Mathematical Analysis for Graduate Students
ENGR	522	Mechanical Properties of Materials
ENGR	526	Electrical Properties of Materials
ENGR	529	Computational Fluid Mechanics
ENGR	535	Introduction to Climate Change & Energy
ENGR	538	Introduction to Environmental Engineering
ENGR	540	Reliability Engineering
ENGR	541	Transport Phenomena in Biological Systems: Engineering Applications
ENGR	543	Wireless Sensor Networks
ENGR	544	Introduction to Multiphase Systems
ENGR	545	High-Resolution Radar Signal Processing
ENGR	545	High-Resolution Radar Signal Processing
ENGR	547	Intermediate Thermodynamics
ENGR	552	Introduction to Imaging Technologies
ENGR	565	Nonlinear Dynamics and Chaos
ENGR	570	Basics of High Performance Computing for Engineers
ENGR	575	Introduction to Systems Analysis
ENGR	576	Introduction to Robotics
ENGR	583	Mech. Design & Optimization of Electronic Syst.
ENGR	584	Introduction to Nanotechnology
ENGR	585	Optimization Methods for Engineering Systems
ENGR	621	Kalman Filtering
ENGR	623	Numerical and Analytical Methods in Partial Differential Equations and Inverse Problems
ENGR	626	Wave Propagation Analysis
ENGR	627	Multiphysics Finite Element Analysis
ENGR	631	Broadband Interferometric Digital Networks
ENGR	634	Digital Image Processing
ENGR	652	Advanced Optical & Imaging Processing
ENGR	693	Directed Research Masters
ENGR	696	Master's Thesis Research
ENGR	696B	Master's Thesis Continuation
ENGR	696CR	Master's Thesis Credit Conferral
ENGR	724	Multiphysics Finite Element Analysis
ENGR	733	NonLinear Dynamics: Physiological Systems
ENGR	753	Active Vibration Control

ENGR	755	Adaptive Control
ENGR	758	Adv Active Vibration Control
ENGR	778	Adaptive Control Systems
ENGR	781	Nonlinear Control
ENGR	797	Special Topics
ENGR	798	Special Topics II
ENGR	993	Directed Research - Doctoral
ENGR	993A	Directed Research - Doctoral
ENGR	996	Doctoral Dissertation Research
ENGR	998A	Doctoral Comprehensive Examination (w/Classes)
ENGR	998B	Doctoral Comprehensive Examination (w/o Classes)
CME	503	Structural Mechanics
CME	504	Finite Element Methods
CME	505	Modal Analysis
CME	519	Applied Mathematics
CME	520	Applied Mathematics II
CME	560	Intro Energy Engr
CME	561	Fund Underwater Acoustics
CME	563	Advanced Vibrations
CME	573	Active Control of Noise & Vib.
CME	574	Machinery Diagnos & Monitor
ME	502	Introduction to Elec. Packaging and MEMS
ME	503	Structural Mechanics
ME	504	Finite Element Methods
ME	505	Programming & Software Tools in Mechanical Engineering
ME	507	Mechanical Systems and Control
ME	510	Modern Control Systems
ME	517	Engineering Optimization Methods
ME	526	Alternative Energy Engineering
ME	527	Renewable Energy & Technology
ME	529	Environmental Protection for Energy Systems
ME	530	Applied Energy Systems
ME	531	Optimal Design of Energy Systems
ME	532	Design of Power and Propulsion Systems
ME	533	Energy Conservation and HVAC
ME	534	Design of HVAC and Refrigeration
ME	535	Design and Optimization of Thermal Systems
ME	536	Thermal Environmental Engineering
ME	537	Air Pollution and Control
ME	539	Combustion and Incineration
ME	541	Conduction and Radiation
ME	543	Heat Exchanger: Design and Analysis
ME	544	Intro to Multiphase Systems

ME	547	Intermediate Thermodynamics
ME	548	Intermediate Heat Transfer
ME	549	Intermediate Fluid Mechanics
ME	550	Combustion and Waste Management
ME	551	Infrared Systems
ME	552	Introduction to Flight Dynamics
ME	554	Aerospace Design
ME	557	Advanced Dynamics
ME	558	Introduction to Ocean Engineering
ME	559	Fundamentals of Ocean Acoustics
ME	560	Introduction to Acoustics
ME	561	Acoustics & Wave Propagation
ME	563	Acoustics Media & Design
ME	564	Structural Acoustics
ME	565	Atmospheric Acoustics
ME	566	Advanced Vibrations and Structural Dynamics I
ME	568	Experimental Vibration and Acoustics
ME	572	Computer Controlled Mechanical Systems
ME	573	Marine Bioacoustics
ME	574	Orbital Mechanics and Mission Design
ME	577	Applied Mechatronics
ME	580	Introduction to MEMS and Microfabrication
ME	581	Introduction to Microfluidics and Lab-on-a-Chip Technologies
ME	582	Introduction to Mechanical Fundamentals of Electronic Systems
ME	583	Mechanical Design and Optimization of Electronic Systems
ME	584	Introduction to Nanotechnology
ME	585	Machine Vision & Imaging Tech. in M.E.
ME	589	Smart Structures
ME	622	Turbulence
ME	640	Advanced Thermodynamics
ME	642	Advanced Heat Transfer
ME	645	Advanced Fluid Dynamics
ME	647	Multiphase Flows
ME	648	Heat Exchangers-Theory and Applications
ME	651	Advanced Topics of Infrared Systems
ME	654	Computational Structural Mechanics
ME	656	Optimal Control
ME	657	Advanced Dynamics
ME	660	Intermediate Acoustics
ME	661	Acoustics Metrology & Materials
ME	663	Transduction in Acoustics/Vibration
ME	664	Modal Analysis
ME	666	Advanced Vibrations and Structural Dynamics II

ME	668	Active and Passive Vibration Control
ME	669	Nonlinear Vibration
ME	701	Finite Element Method: Theory and Applications
ME	703	Advanced Problems in Vibration and Acoustics
ME	704	Advanced Problems in Vibrations and Acoustics II
ME	721	Advanced Computational Fluid Dynamics
ME	726	Advanced Combustion and Multiphase Systems
ME	728	Advanced Problems in Pollution Control
ME	733	Turbulent Flows
ME	741	Advanced Problems in Thermal Science
ME	751	Advanced Topics in Vibration Control
ME	752	Advanced Topics in Mechanics
ME	754	Advanced Computational Structural Analysis
ME	756	Advanced Problems in Controls
ME	760	Advanced Topics in Acoustics
ME	761	Acoustic Imaging