SCHOOL OF ENGINEERING

GRADUATE PROGRAMS

Master of Science in Management of Technology

Master of Science in Mechanical Engineering

Master of Science in Software Engineering

Master of Science in
Electrical and Computer Engineering

Graduate Certificate Programs in

Automated Manufacturing
Database Management
Information Security
Network Technology
Web Application Development

2012-13

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2012-13 ACADEMIC CALENDAR - GRADUATE SCHOOL

Classes are offered on weeknights and Saturdays to accommodate those in the program who are employed full time. Refer to the schedules that are distributed each semester for calendar changes.

Fall 2012

July 5	Registration begins for all Graduate programs for Fall, 2012
July 9	Applications for Degree are due for August graduation-all schools
Sept. 3	Labor Day – University holiday
Sept. 4	Classes begin for all graduate programs
Oct. 8	Columbus Day - University holiday
Oct. 19	Last day of course withdrawal
Nov. 21 - Nov. 25	Thanksgiving Recess
Nov. 26	Classes resume for all schools
Dec. 3	Applications for degree are due for January 30th graduation - all schools
	Registration begins for all Graduate Studies Programs for Spring, 2013
Dec. 21	Last day of classeses/exams for all graduate programs
	(All grades entered on StagWeb 72 hours after final exam is administered)

Spring 2013

Jan. 21	Martin Luther King, Jr. Day - University Holiday
Jan. 22	Classes begin for all graduate programs
Feb. 18	President's Day - University holiday
March 8	Last day of course withdrawal
March 11 - March 15	Spring Recess - all schools
March 18	Classes resume - all schools
March 28 - March 31	Easter Recess all Graduate programs
April 1	Registration begins for all Graduate and Continuing Studies Programs for Summer, 2013
	Applications for Degree are due for May graduation-all schools
	Classes resume - all Graduate programs
May 10	Last day of classes/exams for all graduate programs
	(All grades entered on StagWeb 72 hours after final exam is administered)
May 18	Baccalaureate Mass
May 19	63rd Commencement Graduate Ceremony - 3 p.m.

Summer 2013

May 20 - Aug. 2	Engineering Summer Session
July 8	Registration begins for all Graduate Programs for Fall, 2013
	Applications for Degree are due for August 30th graduation (All schools)

A Message from the President

Dear Student,

Welcome to Fairfield University, and thank you for your interest in our graduate and professional programs.

As a student at Fairfield you will learn from our first-class faculty, who are leaders in their fields, with a strong personal commitment to the education of men and women who share their passion for making a difference in the world.

Fairfield is consistently ranked as one of the top master's level universities in the Northeast and provides advantages to our graduate and professional students that lead to success in their future endeavors. The graduates of our professional and master's programs go on to successful and fulfilling careers, as global leaders in business, education, engineering, nursing, and countless other professions where they are sought after for their intellectual acumen, professional skills, and strength of character.

What distinguishes Fairfield from many other colleges and universities is that as a Jesuit institution, we are the inheritor of an almost 500-year-old pedagogical tradition that has always stressed that the purpose of an education is to develop students as "whole persons" - in mind, body, and in spirit. These Jesuit values are integral to our graduate and professional programs. It is our mission at Fairfield to form men and women who are prepared to be global citizens, confident in their capacities, trained to excel in any circumstance, and inspired to put their gifts at work to transform the world for the betterment of their fellow men and women.

A Fairfield education will shape you in this manner, preparing you to meet future challenges. We invite you to browse through the catalog of courses and take the first step towards your Fairfield education.

Sincerely,

Jeffrey P. von Arx, S.J.

President

Fairfield University Mission

Fairfield University, founded by the Society of Jesus, is a coeducational institution of higher learning whose primary objectives are to develop the creative intellectual potential of its students and to foster in them ethical and religious values, and a sense of social responsibility. Jesuit education, which began in 1547, is committed today to the service of faith, of which the promotion of justice is an absolute requirement.

Fairfield is Catholic in both tradition and spirit. It celebrates the God-given dignity of every human person. As a Catholic university, it welcomes those of all beliefs and traditions who share its concerns for scholarship, justice, truth, and freedom, and it values the diversity that their membership brings to the University community.

Fairfield educates its students through a variety of scholarly and professional disciplines. All of its schools share a liberal and humanistic perspective, and a commitment to excellence. Fairfield encourages a respect for all the disciplines - their similarities, their differences, and their interrelationships. In particular, in its undergraduate schools, it provides all students with a broadly based general education curriculum with a special emphasis on the traditional humanities as a complement to the more specialized preparation in disciplines and professions provided by the major programs. Fairfield is also committed to the needs of society for liberally educated professionals. It meets the needs of its students to assume positions in this society through its undergraduate and graduate professional schools and programs.

A Fairfield education is a liberal education, characterized by its breadth and depth. It offers opportunities for individual and common reflection, and it provides training in such essential human skills as analysis, synthesis, and communication. The liberally educated person is able to assimilate and organize facts, to evaluate knowledge, to identify issues, to use appropriate methods of reasoning, and to convey conclusions persuasively in written and spoken word. Equally essential to liberal education is the development of the aesthetic dimension of human nature, the power to imagine, to intuit, to create, and to appreciate. In its fullest sense, liberal education initiates students at a mature level into their culture, its past, its present, and its future.

Fairfield recognizes that learning is a lifelong process and sees the education that it provides as a foundation upon which its students may continue to build within their chosen areas of scholarly study or professional development. It also seeks to foster in its students a continuing intellectual curiosity and a desire for self-education that will extend to the broad range of areas to which they have been introduced in their studies.

As a community of scholars, Fairfield gladly joins in the broader task of expanding human knowledge and deepening human understanding, and to this end it encourages and supports the scholarly research and artistic production of its faculty and students.

Fairfield has a further obligation to the wider community of which it is a part, to share with its neighbors its resources and its special expertise for the betterment of the community as a whole. Faculty and students are encouraged to participate in the larger community through service and academic activities. But most of all, Fairfield serves the wider community by educating its students to be socially aware and morally responsible people.

Fairfield University values each of its students as individuals with unique abilities and potentials, and it respects the personal and academic freedom of all its members. At the same time, it seeks to develop a greater sense of community within itself, a sense that all of its members belong to and are involved in the University, sharing common goals and a common commitment to truth and justice, and manifesting in their lives the common concern for others which is the obligation of all educated, mature human beings.

Fairfield University Overview

Fairfield University offers education for an inspired life, preparing students for leadership and service through broad intellectual inquiry, the pursuit of social justice, and cultivation of the whole person: body, mind, and spirit.

A comprehensive university built upon the 450-year-old Jesuit traditions of scholarship and service, Fairfield University is distinguished by a rigorous curriculum, close interaction among faculty and students, and a beautiful, 200-acre campus with views of Long Island Sound.

Since its founding in 1942 by the Society of Jesus (the Jesuits), the University has grown from an all-male school serving 300 to a competitively ranked coeducational institution serving 3,300 undergraduate students, 1,300 graduate students, and more than 800 part-time students enrolled for degree completion programs as well as personal and professional enrichment courses.

Fairfield offers over 40 undergraduate majors, 17 interdisciplinary minors, and 38 graduate programs. The University is comprised of five schools: the College of Arts and Sciences, the Charles F. Dolan School of Business, and the schools of Engineering, Graduate Education and Allied Professions, Nursing. Students benefit from small class sizes, an outstanding faculty, a rich array of study abroad, internship, and service opportunities, and the resources and reputation of a school consistently ranked among the top regional universities in the north by the U.S. News & World Report.

In the past decade, more than 60 Fairfield students have been named Fulbright scholars, and the University is among the 12 percent of four-year colleges and universities with membership in Phi Beta Kappa, the nation's oldest and most prestigious academic honor society.

Fairfield is located one hour north of New York City at the center of a dynamic corridor of educational, cultural and recreational resources, as well as leading corporate employers.

Diversity Vision Statement

As a Jesuit and Catholic institution, Fairfield University strives to be a diverse learning community of culturally conscious individuals. The University values and celebrates different perspectives within a commitment to the God-given dignity of the human person. As an expression of its dedication to the service of faith and the promotion of justice, the Fairfield community seeks to create an environment that fosters a deep understanding of cultural and human diversity. This diversity enriches its members, both as individuals and as a community, and witnesses to the truth of human solidarity.

Fairfield University is committed to promoting dialogue among differing points of view in order to realize an integral understanding of what it is to be human. The University recognizes that transcending the nation's political and social divisions is a matter of valuing diversity and learning respect and reverence for individuals, in their similarities and their differences. Fairfield will continue to integrate diversity in all facets of University life - academic, administrative, social, and spiritual - as together, the community seeks to realize a vision of the common good.

Campus Services

The **DiMenna-Nyselius Library** is the intellectual heart of Fairfield's campus and its signature academic building, combining the best of the traditional academic library with the latest access to print and electronic resources. Carrels, leisure seating, and research tables provide study space for up to 900 individual students, while groups meet in team rooms, study areas, or convene for conversation in the 24-hour cafe. Other resources include a 24-hour, open-access computer lab with Macintosh and Intel-based computers; a second computer lab featuring Windows-based computers only; two dozen multimedia workstations; an electronic classroom; a 90-seat multimedia auditorium; photocopiers, microform readers, and printers; and audiovisual hardware and software. Workstations for the physically disabled are available throughout the library.

The library's collection includes more than 365,000 bound volumes, 290,000 e-books, 528 journal and newspaper subscriptions, electronic access to 53,000 full-text journal and newspaper titles, 18,000 audiovisual items, and the equivalent of 110,000 volumes in microform. To borrow library materials, students must present a StagCard at the Circulation Desk. Students can search for materials using an integrated library system and online catalog. Library resources are accessible from any desktop on or off campus at www.fairfield.edu/library. From this site, students use their NetID to access their accounts, read full-text journal articles from more than 170 databases, submit interlibrary loan forms electronically, or contact a reference librarian around the clock via IM, e-mail, Skype, or “live” chat.

The library has an Information Technology Center consisting of a 30-seat, state-of-the-art training room, a 12-seat conference/group study room with projection capability, and 10 collaborative work areas. Also, the Center for Academic Excellence is housed on the lower level.

During the academic year, the library is open Monday through Thursday, 7:45 a.m. to midnight; Friday,7:45 a.m. to 10:30 p.m.; Saturday, 9 a.m. to 9 p.m.; and Sunday, 10:30 a.m. to midnight with an extended schedule of 24/7 during exam periods.

The **Rudolph F. Bannow Science Center** houses advanced instructional and research facilities that foster the development of science learning communities, engage students in experiential learning, and invite collaborative faculty and student research in biology, chemistry, computer science, mathematics, physics, and psychology.

The **John A. Barone Campus Center** (BCC) is the social focal point of University activities and offers students a place to relax, socialize, or study during the day. Students can pick up a cup of coffee at the cafe; shop at the Stag Spirit Shop; visit the StagCard office; watch deejays from the campus radio station, WVOF-FM 88.5, at work in their glass-enclosed studio; or grab meals at one of the dining facilities. For BCC hours check the University Activities website at www.fairfield.edu/universityactivities.

The **Fairfield University Bookstore**, located at 1499 Post Road in downtown Fairfield, offers students a unique location to purchase textbooks and other reading materials as well as apparel, gifts and supplies. Starbucks adjoins the bookstore and frequent free public events are offered.

The **Early Learning Center** provides an early care and education program based on accepted and researched theories of child development; individualized programs designed to meet the needs of each child; a curriculum that is child-oriented and emergent by the children; and teaching staff who have specialized educational training in child development and developmentally appropriate practice with young children, including health, safety, and nutritional guidelines.

The Center is open all year from 7:30 a.m.-5:30 p.m. for children aged 6 weeks to 5 years. Children may be enrolled on a full or part-time basis depending upon space availability. Registration takes place every March. For tuition details, registration requirements, or other information, call the Center at (203) 254-4028 or visit www.fairfield.edu/gseap/elc.

Aloysius P. Kelley, S.J. Center. Located on Loyola Drive, the Kelley Center houses the offices of Undergraduate and Graduate Admission, the Registrar, Financial Aid, Enrollment Management, Academic and Disability Support Services, New Student Programs, as well as the Career Planning Center.

The **Career Planning Center** is open to graduate students and offers career information, online job listings, and career counseling services. The Center also invites leading employers to recruit on campus. Graduate students who wish to leverage their master’s degrees in a career transition should meet with a career planning counselor one year before graduation.

Campus Ministry, located in lower level of the Egan Chapel of St. Ignatius Loyola, strives to be a home for students of all faith traditions who are interested in exploring and enriching their spiritual lives. Rooted in the Catholic faith and steeped in the Jesuit tradition, Campus Ministry is committed to the development of the whole person, because a healthy spiritual life is an essential element of the Fairfield University experience. There are a wide variety of popular programs offered including retreats, musical, Eucharistic, and lector liturgical ministries, and many social justice advocacy programs that Fairfield’s graduate students are welcome to join. Urban, national, and international student volunteer programs take place during the University’s winter, spring and summer breaks. All students are invited to participate in all programs, regardless of their faith tradition. In an effort to meet the spiritual needs of our non-Catholic students, Campus Ministry co-sponsors a host of services such as Shabbat services. A Muslim Chaplain Intern is also available to provide support to our Muslim students. The staff also offers opportunities for one-on-one conversation, pastoral counseling, and spiritual direction. For more information on events, programs and a schedule of liturgies, go to www.fairfield.edu/student/cm_about.html336

Computing Services at Fairfield are state-of-the-art. High-speed fiber-optic cable, with transmission capabilities of 1 gigabit per second, connects classrooms, residence hall rooms, and faculty and administrative offices, providing access to the library collection, e-mail, various databases, and other on-campus resources.

Twelve computer labs, supported by knowledgeable lab assistants and open 14 hours a day for walk-in and classroom use, offer hardware and software for the Windows and Macintosh environments. All campus buildings are connected to the Internet, and all residence hall rooms have Internet connections, cable television, and voicemail. Students are issued individual accounts in StagWeb, a secure Web site where they can check e-mail, register for courses, review their academic and financial records, and stay tuned to campus-wide announcements.

Administrative Computing (Ellucian) is located in Dolan 110 East and provides support for the integrated administrative system, Banner. Additionally, Administrative Computing supports StagWeb, the campus portal that enables students to access their e-mail, grades, calendars, course schedules and other types of information.

Computing and Network Services (CNS), located on the first and second floors of Dolan Commons, provides lab support, technical advice, classroom technology applications, and personal Web page assistance. All computing and network infrastructure on campus, the telecommunications system, hardware and soft-

ware support for faculty and staff desktops/laptops, and operational support for public computer labs fall within the jurisdiction of CNS. Office hours are 8:30 a.m. to 4:30 p.m. and the Help Desk number is (203) 254-4069 or cns@fairfield.edu.

The **Department of Public Safety** (DPS) is responsible for the safety of people and property on campus. Officers patrol campus by bike, foot, and vehicle 24 hours a day, 365 days a year. The Department of Public Safety is authorized to prevent, investigate, and report violations of State or Federal Law and University regulations. In addition, officers are trained to provide emergency first aid and are supplemental first responders for the Town of Fairfield. Public Safety officers also oversee the flow of traffic on campus and enforce parking regulations. Any student, faculty member, or employee of Fairfield University should report any potential criminal act or other emergency to any officer or representative of DPS immediately by calling (203) 254-4090 or visiting Loyola Hall, Room 2.

Arts and Minds Programs

Fairfield University serves as an important hub for students and visitors from the region seeking entertaining and inspiring cultural events and activities. The Regina A. Quick Center for the Arts houses the Alyoisius P. Kelley, S. J. Theatre, the Lawrence A. Wien Experimental Theatre, and the Thomas J. Walsh Art Gallery. Various departments also host exhibitions, lectures and performance programs throughout the academic year, including the popular lecture series Open Visions Forum. The new Bellarmine Museum of Art is located in Bellarmine Hall and displays a rich and varied collection of paintings, sculpture and decorative arts objects. Not only is the Museum a showcase for significant art objects, but it serves as a learning laboratory for students and members of the regional community. All Fairfield students receive free or discounted tickets for arts events. For a cultural calendar visit http://www.fairfield.edu/arts.

The Office of Graduate Student Life

This office was established to help foster a sense of community among graduate students by organizing and planning intellectual, cultural, and social events, recreational outings, Jesuit service learning and other activities. Each semester, the Office of Graduate Student Life located in the Barone Campus Center, publishes a calendar with a variety of events and programs for graduate students, a graduate student e-newsletter, and keeps students involved with updated social media. The Graduate Student Assembly is an advisory board of graduate students from each program, working to assist and advocate for the graduate student experience and the Jesuit character of our programs. The graduate student assembly acts as the liaison between the graduate student body and the University administration.

Athletics and Recreation

Fairfield is a Division I member of the National Collegiate Athletic Association (NCAA) and competes in conference championship play as a charter member of the Metro Atlantic Athletic Conference (MAAC). The men's and women's basketball teams play most of their games at Bridgeport's Webster Bank Arena at HarborYard, considered one of the top facilities in collegiate basketball. Discounted tickets for Fairfield Stags games are available to graduate students. For tickets or other information, call the athletics ticket box office or visit www.fairfieldstags.com. In addition, soccer, lacrosse, and other athletic events are held on campus and are free to graduate students.

The **Leslie C. Quick Jr. Recreation Complex**, a multipurpose facility also known as the RecPlex, features a 25-meter, eight-lane swimming pool; a field house for various sports; a whirlpool; saunas in the men's and women's locker rooms; and racquetball courts. Other amenities are two cardio theatres, a weight room, and group fitness courses. The Department of Recreation also oversees the outdoor tennis and outdoor basketball courts. Graduate students may join the RecPlex on a per semester basis by presenting a current StagCard, proof of current registration, and paying the appropriate fee. For membership information and hours, call the RecPlex office at (203) 254-4141.

Other Requirements

NetID

A NetID is your username and password combination that provides you access to a variety of University online services, including Gmail and StagWeb.

- Your NetID username is not case sensitive
- It is generated from University records, and it is a combination of your first, middle, and last names or initials
- Your NetID is not the same as your Fairfield ID number, which is on the front of your StagCard

Your NetID will remain active until you graduate. You will need to change your password every 90 days.

To activate (or "claim") your NetID account, you will need to log in to the Fairfield University NetID Manager Web site: http://netid.fairfield.edu. For more detailed information, including step-by-step instructions, visit www.fairfield.edu/netid.

You will need your eight-digit Fairfield ID number to activate your NetID, which can be found on the front of your StagCard, or in the upper right-hand corner of your student schedule.

After claiming your NetID, visit http://mail.student.fairfield.edu to log in. Please check your Gmail account regularly, and be sure to use it to communicate with all University officials (faculty, staff, etc.).

Your e-mail address follows this format: netid@student.fairfield.edu. If your name is John Smith, and your NetID is john.smith, then your e-mail address is john.smith@student.fairfield.edu.

The StagCard

All students are required to obtain a StagCard, the University's official identification card. With the StagCard, graduate students can gain access to the University's computer labs, the library, StagPrint, and much more. Graduate students can also purchase a membership to the Quick Recreational Complex, which requires a valid StagCard for entry.

To obtain a StagCard students need a valid, government-issued photo identification card. Also, proof of course registration will expedite the issuance of the card, but is not required. Please note: Returning students can use their existing StagCard.

The StagCard Office is located in the Barone Campus Center, Residence Life Suite. Office hours are: Monday, Wednesday, Thursday, and Friday from 8:30 a.m. to 4:30 p.m.; Tuesday from 11 a.m. to 7 p.m. Note: Summer hours may vary from those listed in this catalog. For more information, visit the Web site at www.fairfield.edu/stagcard, e-mail stagcard@fairfield.edu, or call (203) 254-4009.

StagWeb (http://stagweb.fairfield.edu)

All graduate students are issued individual accounts for StagWeb, a secure website used to view course schedules, access library services remotely, register for classes and parking permits, view and pay tuition bills, print unofficial transcripts, and much more.

Students may also register their cell phone number for entry into the StagAlert system, Fairfield University's emergency notification system. Click on the "Enter Cell Phone Number" link in the upper right-hand corner of the My StagWeb tab and follow the prompts

Students can log in to StagWeb with their Net ID and password, and the account will be available within 24 hours of registering for classes for the first time. For assistance with StagWeb call the help desk at (203) 254-4069 or e-mail helpdesk@fairfield.edu.

Parking on Campus

All vehicles must be registered with the Department of Public Safety and display a current vehicle registration sticker. For graduate students, the fee for this is included as part of tuition. However, graduate students must register their vehicle. To do so, students complete and submit the online registration form available on StagWeb. Students should then bring a copy of the submitted application to Public Safety (Loyola Hall, Room 2) with proof of enrollment and their state vehicle registration. A pamphlet detailing traffic and parking regulations will be provided with the registration sticker. Vehicles parked in fire lanes, handicapped spaces, or service vehicle spots are subject to fines and may be towed at the owner's expense. Vehicles of disabled persons must display an official state handicapped permit.

ACCREDITATIONS

Fairfield University is fully accredited by the New England Association of Schools and Colleges, which accredits schools and colleges in the six New England states. Accreditation by one of the six regional accrediting associations in the United States indicates that the school or college has been carefully evaluated and found to meet standards agreed upon by qualified educators.

Additional accreditations include:

AACSB International – The Association to Advance Collegiate Schools of Business
(Charles F. Dolan School of Business)

Accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org
(School of Engineering)
B.S. Mechanical engineering
B.S. Electrical engineering
B.S. Computer engineering
B.S, Software engineering

American Chemical Society
(College of Arts and Sciences)
B.S. in Chemistry

Commission on Accreditation of Marriage and Family Therapy Education of the American Association for Marriage and Family Therapy
(Graduate School of Education and Allied Professions, GSEAP)
Marriage and Family Therapy program

Commission on Collegiate Nursing Education
(School of Nursing)
Undergraduate Nursing Programs
Masters Nursing Programs

Connecticut State Department of Higher Education
(GSEAP)

Council for Accreditation of Counseling and Related Educational Programs
(GSEAP)
Counselor Education programs

National Association of School Psychologists (NASP)
(GSEAP)
School Psychology

Program approvals include:

Connecticut State Office of Financial and Academic Affairs for Higher Education
Elementary and Secondary Teacher certification programs
Graduate programs leading to certification in specialized areas of education
School of Nursing programs

Connecticut State Department of Education and National Council for the Accreditation of Teacher Educators (NCATE)
Elementary and Secondary Education
Special Education
TESOL/Bilingual Education
School Counseling
School Library Media
School Psychology

Connecticut State Board of Examiners for Nursing
Undergraduate Nursing programs

Council on Accreditation of Nurse Anesthesia Educational Programs

The University holds memberships in:

AACSB International – The Association to Advance Collegiate Schools of Business

American Association of Colleges for Teacher Education

American Association of Colleges of Nursing

American Council for Higher Education

American Council on Education

ASEE – American Society for Engineering Education

Association of Catholic Colleges and Universities

Association of Jesuit Colleges and Universities

Connecticut Association of Colleges and Universities for Teacher Education

Connecticut Conference of Independent Colleges

Connecticut Council for Higher Education

National Action Council for Minorities in Engineering

National Association of Independent Colleges and Universities

National Catholic Educational Association

New England Business and Economic Association

COMPLIANCE STATEMENTS AND NOTIFICATIONS

Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act

Fairfield University complies with the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act. This report contains a summary of the Fairfield University Department of Public Safety's policies and procedures along with crime statistics as required. A copy of this report may be obtained at the Department of Public Safety office, located on the ground floor of Loyola Hall, Room 2 or by accessing our website at www.fairfield.edu/clery. The Department of Public Safety is open 24 hours per day, 365 days a year. The University is in compliance with the Student Right to Know and Campus Security Act (PL 103-542).

Fairfield is a drug-free campus and workplace.

Catalog

The provisions of this catalog are not to be regarded as an irrevocable contract between Fairfield University and the students. The University reserves the right to change any provision or any requirement at any time. The course listings represent the breadth of the major. Every course is not necessarily offered each semester.

Non-Discrimination Statement

Fairfield University admits students of any sex, race, color, marital status, sexual orientation, gender identity, religion, age, national origin or ancestry, disability or handicap to all the rights, privileges, programs, and activities generally accorded or made available to students of the University. It does not discriminate on the basis of sex, race, color, marital status, sexual orientation, gender identity, religion, age, national origin or ancestry, disability or handicap in administration of its educational policies, admissions policies, employment policies, scholarship and loan programs, athletic programs, or other University-administered programs.

Notification of Rights Under FERPA

In accordance with the Family Education Rights and Privacy Act (FERPA) as amended, Fairfield University provides the following notice to students regarding certain rights with respect to their educational records. FERPA rights apply to students “in attendance” (regardless of age) and former students. For purposes of Fairfield University’s FERPA policy, a student is considered “in attendance” the day the student first attends a class at Fairfield University. That is the day that the FERPA rights described in this policy go into effect for the student.

The rights afforded to students with respect to their education records under FERPA are:

1. The right to inspect and review the student’s education records within 45 days of the day the University receives a request for access. Students should submit to the registrar, dean, head of the academic department, or other appropriate official, written requests that identify the record(s) they wish to inspect. The University official will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the University official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.

2. The right to request the amendment of the student’s education records that the student believes are inaccurate or misleading. Students may ask the University to amend a record that they believe is inaccurate or misleading. They should write to the University official responsible for the record, clearly identify the part of the record they want changed, and specify why it is inaccurate or misleading. If the University decides not to amend the record as requested by the student, the University will notify the student of the decision and advise the student of his or her right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

3. The right to consent to disclosures of personally identifiable information contained in the student’s education records, except to the extent that FERPA authorizes disclosure without consent.

a. One exception that permits disclosure without consent is disclosure to school officials with legitimate educational interests. A school official is a person employed by the University in an administrative, supervisory, academic or research, or support staff position (including law enforcement unit personnel and health staff); a person or company with whom the University has contracted (including but not limited to, an attorney, auditor, collection agent, or a provider of e-mail, network or other technological services (e.g., Google/Gmail); a person serving on the Board of Trustees; or a student serving on an official committee, such as a disciplinary or grievance committee, or assisting another school official in performing his or her tasks. A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility.

b. FERPA does make exceptions for disseminating information to students’ parents or legal guardians, including if the student is under 21 years old and the disclosure concerns the student’s violation of University policy concerning the possession or use of alcohol or a controlled substance.

c. FERPA permits the non-consensual disclosure of personally identifiable information from education records in connection with a health or safety emergency.

d. FERPA permits the non-consensual disclosure of education records in compliance with a lawfully issued subpoena or court order.

e. Another exception that permits disclosure without consent is the disclosure of directory information, which the law and Fairfield University define to include the following: a student's name, home address including e-mail address, telephone number, date and place of birth, visual image (photographs); dates of attendance, major and minor, enrollment status, class year, degrees/awards received, other institutions attended, and weight and height information for members of athletic teams.

This exception related to directory information is subject to the right of the student to object to the designation of any or all of the types of information listed above as directory information in his or her case, by giving notice to the Office of the Dean of Students on or before September 15 of any year. If such an objection is not received, Fairfield University will release directory information when appropriate.

4. The right to file a complaint with the U.S. Department of Education concerning alleged failures by the University to comply with the requirements of FERPA. The name and address of the office that administers FERPA is:

Family Policy Compliance Office

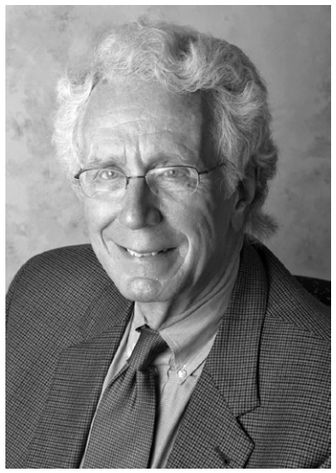
U.S. Department of Education 400 Maryland Avenue, S.W.

Washington, DC 20202-4605

The Title II Higher Education Reauthorization Act Report is available online at www.fairfield.edu/titlereport.

School of Engineering

A Message from the Dean

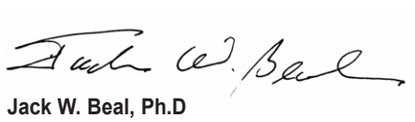


The four graduate programs in the School of Engineering - master of science degrees in Management of Technology (MSMOT), in Software Engineering (MSSE), in Electrical and Computer Engineering (MSECE), and in Mechanical Engineering (MSME) are driven by the needs of the School's constituencies, the students, and their employers, who establish multifaceted requirements for current knowledge and skills at the workplace. The MSMOT program includes some courses from the MBA program in the Charles F. Dolan School of Business. In further response to workplace needs, the School has instituted a five-year dual degree BS/MS program in Software Engineering, which is meant to serve as a fast track to completing the master's degree in this discipline. Both degrees, the bachelor's degree and the master's degree in Software Engineering, will be awarded at the end of the five-year course of study. Finally, the School offers graduate certificate programs - each comprised of a sequence of four courses - to benefit practicing engineers who are in need of specialized knowledge and skills in Automated Manufacturing, Database Management, Information Security, Network Technologies or Web Application Development strategies. Hence, the engineering programs are inherently dynamic and responsive to industry and business. Their capacity to change, and so remain current, originates with the faculty in the School of Engineering who are leading-edge professionals in their areas of expertise and in instruction and mentoring. It is also prompted by the administration team, which is entrepreneurial in delivering graduate education and in maintaining close contacts and open lines of communication with the industry and business sectors that are the main beneficiaries of the School's Master degree graduates.

Located in Fairfield County, Fairfield University is in the middle of a high-density concentration of hardware and software industries and businesses; nearly 40 Fortune 500 companies are headquartered within 50 miles of the campus. This environment provides opportunities for studies of real-world problems in courses and in the capstone professional project required by the graduate programs, and for advancement and employment of Fairfield graduates. The degree to which prescribed learning goals and program objectives are achieved by our students is measured through the Assessment and Continuous Quality Improvement Process (ACQIP) - a three-year cycle of outcomes assessment and quality management - that is in effect in the School of Engineering. ACQIP embodies the philosophical and operational principles that are the foundation for the high quality of graduate and undergraduate engineering education at Fairfield University. This paradigm makes it possible for the School to continue satisfying graduate students' educational expectations.

Our various programs offer many opportunities for our students to pursue their special interests and grow professionally and personally.

I would like to extend a warm welcome to all who choose to undertake the exciting adventure of graduate education in the School of Engineering at Fairfield University.



Jack W. Beal, Ph.D

Dean, School of Engineering

THE SCHOOL OF ENGINEERING OVERVIEW

Headquartered in McAuliffe Hall, the School of Engineering has laboratory and instructional facilities in this building as well as in the Rudolph F. Bannow Science Center. Among these resources are several networked computer laboratories and Internet services, completely dedicated to the instructional purposes of the School. The School of Engineering operates its own separate network linking all its classrooms and laboratories.

The School continuously measures the outcomes of its educational enterprise through the Assessment and Continuous Quality Improvement Process (ACQIP), a three-year cycle of quality management. This process includes identifying the constituencies and stakeholders of the engineering programs, determining which learning goals and program objectives are compatible with the needs of those constituencies, crafting curriculum content, and developing resources to satisfy student learning and development in accord with those needs. ACQIP leads to two concrete results: It assesses the degree to which student learning goals are achieved, and it identifies opportunities for improving program design and implementation.

The School of Engineering maintains an appropriate balance of faculty in each discipline within the School, and strives to create an environment conducive to faculty development and consistent with achieving excellence in pedagogy and professional advancement. The School also maintains a close working relationship with industry through its Advisory Board and other conduits, to better understand the needs of the engineering workplace, and draws from its network of practitioners in the engineering disciplines for assistance in program development and assessment.

Mission Statement and Goals of the School of Engineering

Mission

In keeping with the mission of Fairfield University, the School of Engineering is committed to preparing students for leadership and success in their personal and professional lives, and to educating the whole person, one who is socially responsible and prepared to serve others as well as able to contribute to his/her discipline.

Objectives

The programs and curricula of the School of Engineering are directed to a diverse student population. Through innovation and an integration of disciplines in the arts and sciences with those of engineering, technology, and business, the programs provide the interdisciplinary knowledge, personal skills, and technical competencies necessary in our increasingly complex and sophisticated world. Project management and leadership skills are also overarching competencies needed for engineers to meet the grand challenges of the profession in the 21st century.

Specifically, the engineering programs have adopted four major program objectives:

- to provide students with knowledge in the discipline,
- to teach students the skills necessary in exercising the discipline, such as problem solving, design, and an aptitude for innovation, as well as project management and communication skills
- to encourage students to adopt life-long learning practices across the spectrum of human knowledge,
- to convey to students a sense of social responsibility and provide opportunities for service learning.

The key to educating students in their chosen disciplines rests on curricula and instructional practices crafted to promote the students' ability to design solutions to complex problems, assess the effectiveness of the design from a variety of perspectives, including economy and reliability, and proceed to implementation, testing, and validation of design.

The School of Engineering emphasizes excellence in the classroom, in research and development, and in the application of ideas to the world of technology and business. It fosters currency, relevance, and excellence in the curricula, and devotes resources to its facilities and programs, and to the professional development of faculty and staff.

SCHOOL OF ENGINEERING GRADUATE ADMISSION

Admission Policies

In carrying out its mission, the School of Engineering admits graduate students to master of science degree programs in management of technology, software engineering, electrical and computer engineering, and mechanical engineering. Candidates for admission to those programs must have earned the requisite bachelor's degree from a regional accredited college or university or the international equivalent, and have knowledge and skills in certain areas such as computer programming and statistics (and financial accounting, in the case of the management of technology program). Students with gaps in those areas are expected to complete bridge courses soon after they enter the program. Students create their plan of study early in their graduate career, under the supervision and guidance of program directors, so that they may meet their educational and professional goals in a time-effective and intellectually satisfying manner. Graduate courses are offered in evening classes and on weekends to serve the needs of part-time graduate students from the regional technology and business community, as well as the needs of full-time graduate students. Class sizes are small - 10 to 20 students on average - with an emphasis on close interaction between participants and faculty.

Admission Criteria and Procedures

Management of Technology (MSMOT)

Admission will be granted to applicants with a bachelor of science degree in science or engineering, or the equivalent, or to applicants with extensive experience in a technology environment, whose academic and professional records suggest the likelihood of success in a demanding graduate program. Applicants will have completed one course in introductory probability and statistics, one course in computer programming that uses a high-level language and includes applications, and one course in financial accounting, or demonstrate aptitude in these subjects. Applicants who have not completed these courses and who are unable to demonstrate aptitude in these subjects must register for one or more of the bridge courses (undergraduate level) offered in these subjects early in their graduate studies.

Software Engineering (MSSE)

Admission will be granted to applicants with a bachelor's degree and adequate experience as a professional software developer or programmer, whose academic and professional records suggest the likelihood of success in a demanding graduate program. Potential students with an undergraduate degree in an area other than software engineering, computer science, or the equivalent, may need to take bridge courses (undergraduate level), e.g., SW 131, SW 232, and to develop the required background for the program.

Electrical and Computer Engineering (MSECE)

Admission will be granted to applicants with a bachelor's degree in science or engineering or its equivalent, or to those with work experience in a technology environment, whose academic and professional records suggest the likelihood of success in a demanding graduate program in the electrical or computer engineering disciplines. Furthermore, applicants should demonstrate aptitude in the subject matter of such bridge courses (undergraduate level) as EE 213, Electric Circuits, and EE 231, Electronic Circuits and Devices, or begin their studies by registering for one or more of the bridge courses.

Mechanical Engineering (MSME)

Admission will be granted to applicants with a bachelor's degree in science or engineering, or its equivalent, in the general area of mechanical engineering, or to those with work experience in a technology environment, whose academic and professional records suggest the likelihood of success in a demanding graduate program. Furthermore, applicants should demonstrate aptitude in the subject matter of engineering design, materials and thermodynamics, or begin their studies by registering for one or more bridge courses (undergraduate level) in these areas.

Application Materials

Applicants for admission in all programs must submit the following materials for consideration:

1. A completed Application for Admission form. Apply online at www.fairfield.edu/soeapp
2. A non-refundable $60 application fee
3. An official copy of transcripts from all previously attended colleges or universities
4. Two letters of recommendation, one of which must be from a current supervisor or professor, accompanied by the University recommendation forms
5. A professional resume
6. A personal statement. Students should describe why they want to undertake graduate studies in the program for which they are applying for admission.

Applications are accepted on a rolling basis.

Measles and Rubella Immunization

Connecticut Law requires that students born after December 31, 1956 provide proof of Measles and Rubella Immunization. This includes two doses of measles vaccine administered at least one month apart (the second dose must be given after December 31, 1979) and one dose of rubella vaccine after the student's first birthday. The exception to this is students who provide laboratory documentation of immunity to measles and rubella.

Although this is not required to complete an application, you must provide proof of immunization prior to course registration. Please keep in mind that this process can take some time, and that you MUST be in compliance before registration. Immunization verification information should be submitted directly to the University's Health Center. You can download the necessary form at www.fairfield.edu/immunization. Any questions regarding this policy should be directed to the University Health Center by calling (203) 254-4000, ext 2241.

International Students

International applicants must also provide a certificate of finances (evidence of adequate financial resources in U.S. dollars) and must submit certified English translations and course-by-course evaluations, done by an approved evaluator (found on our website at www.fairfield.edu/eval) of all academic records. All international students whose native language is not English must demonstrate proficiency in the English language by taking either TOEFL or IELTS exams. A TOEFL composite score of 550 for the paper test, 213 for the computer-based, or 80 on the internet based test is strongly recommended for admission to the graduate school. Scores must be sent directly from the Educational Testing Service. An IELTS score of 6 .5 or higher is strongly recommended for admission to the graduate school. Scores must be sent directly from the IELTS.org (Fairfield's ETS code is 3390). TOEFL and IELTS may be waived for those international students who have earned an undergraduate or graduate degree from a regionally accredited U.S. college or university. International applications and supporting credentials must be submitted at least three months prior to the intended start date.

Students with Disabilities

Fairfield University is committed to providing qualified students with disabilities an equal opportunity to access the benefits, rights, and privileges of its services, programs, and activities in an accessible setting. Furthermore, in compliance with Section 504 of the Rehabilitation Act, the Americans with Disabilities Act, and Connecticut laws, the University provides reasonable accommodations to qualified students to reduce the impact of disabilities on academic functioning or upon other major life activities. It is important to note that the University will not alter the essential elements of its courses or programs.

If a student with a disability would like to be considered for accommodations, he or she must make this request in writing and send the supporting documentation to the director of Academic and Disability Support Services. This should be done prior to the start of the academic semester and is strictly voluntary. However, if a student with a disability chooses not to self-identify and provide the necessary documentation, accommodations need not be provided. All information concerning disabilities is confidential and will be shared only with a student's permission. Fairfield University uses the guidelines suggested by CT AHEAD to determine disabilities and reasonable accommodations.

Send letters requesting accommodations to:

Director of Academic and Disability Support Services
Fairfield University
1073 North Benson Road
Fairfield, CT 06824-5195.

SCHOOL OF ENGINEERING GRADUATE TUITION, FEES, AND FINANCIAL AID

Tuition and Fees

The schedule of tuition and fees for the academic year:

Application for matriculation (not refundable)	$60
Registration per semester	$30
Graduate Student Activity Fee per semester	$35
MSMOT tuition per credit	$780
MSSE tuition per credit	$660
MSECE tuition per credit	$660
MSME tuition per credit	$660
Continuing Registration Fee	$50
Commencement fee (required of all degree recipients)	$150
Transcript	$4
Promissory note fee	$25
Returned check fee	$30

The University's Trustees reserve the right to change tuition rates and the fee schedule and to make additional changes whenever they believe it necessary.

Full payment of tuition and fees, and authorization for billing a company must accompany registration. Payments may be made in the form of cash (in person only), check, money order, credit card (MasterCard, VISA, or American Express), or online payment at www.fairfield.edu/bursar. All checks are payable to Fairfield University.

Degrees will not be conferred and transcripts will not be issued until students have met all financial obligations to the University.

Deferred Payment

During the fall and spring semesters, eligible students may defer payment on tuition as follows:

1. For students taking fewer than six credits: At registration, the student pays one-half of the total tuition due plus all fees and signs a promissory note for the remaining tuition balance. The promissory note payment due date varies according to each semester.
2. For students taking six credits or more: At registration, the student pays one-fourth of the total tuition due plus all fees and signs a promissory note to pay the remaining balance in three consecutive monthly installments.
3. Failure to honor the terms of the promissory note will prevent future deferred payments and affect future registrations.

Reimbursement by Employer

Many corporations pay their employees' tuition. Students should check with their employers. If they are eligible for company reimbursement, students must submit, at in-person registration, a letter on company letterhead acknowledging approval of the course registration and explaining the terms of payment. The terms of this letter, upon approval of the Bursar, will be accepted as a reason for deferring that portion of tuition covered by the reimbursement. Even if covered by reimbursement, all fees (registration, processing, lab, or material) are payable at the time of registration.

Students will be required to sign a promissory note, which requires a $25 processing fee, acknowledging that any outstanding balance must be paid in full prior to registration for future semesters. A guarantee that payment will be made must be secured at the time of registration with a MasterCard, VISA, or American Express credit card. If the company offers less than 100-percent unconditional reimbursement, the student must pay the difference at the time of registration and sign a promissory note for the balance. Letters can only be accepted on a per-semester basis. Failure to pay before the next registration period will prevent future deferred payments and affect future registration.

Refund of Tuition

All requests for tuition refunds must be submitted to the appropriate dean's office immediately after withdrawal from class. Fees are not refundable. The request must be in writing and all refunds will be made based on the date notice is received or, if mailed, on the postmarked date according to the following schedule. Refunds of tuition charged on a MasterCard, VISA, or American Express must be applied as a credit to your charge card account.

Before first scheduled class	100 percent
Before second scheduled class	90 percent
Before third scheduled class	80 percent
Before fourth scheduled class	60 percent
Before fifth scheduled class	40 percent
Before sixth scheduled class	20 percent
After sixth scheduled class	No refund

Refunds take two to three weeks to process.

Financial Aid

Assistantships

A limited number of part- and full-time University graduate assistantships are available to assist promising and deserving students. Assistantships are awarded for one semester only and students must reapply each semester for renewal of an assistantship award. Renewal of an award is based on academic performance and previous service performance, and is at the discretion of the hiring department. A list of known assistantships is available at www.fairfield.edu/gradadmission/gfa_assist.html.

Scholarships

The School of Engineering provides modest scholarships to select graduate students on the basis of need and merit. Interested students should complete a Financial Aid application with the School of Engineering and submit it to the Dean's office with supporting materials.

Federal Direct Stafford Loans

Under this program, graduate students may apply for up to $20,500 per academic year, depending on their educational costs. Beginning July 1, 2012, interest payments are no longer subsidized by the federal government during graduate student enrollment.

When a loan is unsubsidized, the student is responsible for the interest and may pay the interest on a monthly basis or opt to have the interest capitalized and added to the principal. There is a six-month grace period following graduation or withdrawal, before loan payments must begin.

How to Apply

Step One:

- Complete a Free Application for Federal Student Aid (FAFSA) online at www.fafsa.ed.gov, indicating your attendance at Fairfield University (Title IV code 001385).

Step Two:

- Complete the required Entrance Counseling and Master Promissory Note (MPN) at www.studentloans.gov.

Step Three:

- Financial Aid administrators at Fairfield University will process your loan when your file is finalized, entrance counseling has been completed, and the MPN is signed.
- You will be notified of the approval of the loan via the Notice of Loan Guarantee and Disclosure Statement.

Loan Disbursement

- If you are a first time borrower at Fairfield University, your loan will not disburse until you have completed the required entrance counseling.
- Your loan will be disbursed according to a schedule established by Fairfield University and federal guidelines. Disbursement will be made in two installments for the year and transferred electronically to your University account.
- The total amount of the funds (minus any origination fees) will be outlined in the Notice of Loan Guarantee and Disclosure Statement sent to you by the Department of Education.

If you have any questions, please contact the Office of Financial Aid at (203) 254-4125 or finaid@fairfield.edu.

Alternative Loans

These loans help graduate and professional students pay for their education at the University. For further information view online at: www.fairfield.edu/gradloans.

Tax Deductions

Treasury regulation (1.162.5) permits an income tax deduction for educational expenses (registration fees and the cost of travel, meals, and lodging) undertaken to: maintain or improve skills required in one's employment or other trade or business; or meet express requirements of an employer or a law imposed as a condition to retention of employment job status or rate of compensation.

Veterans

Veterans may apply VA educational benefits to degree studies pursued at Fairfield University. Veterans should consult with the Office of Financial Aid regarding the process and eligibility for possible matching funds through Fairfield's Veterans Pride Program. Information about the program, including free tuition for some veterans, is available at www.fairfield.edu/veterans

The University Registrar's office will complete and submit the required certification form for all VA benefits.

Consumer Information

Federal regulations require colleges to inform students of their prospects for "gainful employment" when receiving federal financial aid for non-degree programs. The disclosures were mandated to assist students in choosing the right program for their needs and to prevent them from taking on debt in exchange for programs that fail to get them adequate job. To find more about Gainful Employment Disclosures, go to www.fairfield.edu/about/about_gainful_employ.html

SCHOOL OF ENGINEERING GRADUATE ACADEMIC POLICIES AND GENERAL REGULATIONS

Academic Advising and Curriculum Planning

Specialty Track Directors advise all fully matriculated students in their respective tracks. The Assistant Dean advises all non-matriculated students. Students must meet with their advisor during their first semester of enrollment to plan a program of study. The advisor must be consulted each subsequent semester regarding course selection, and the advisor's signature of approval on the University registration form is required. Students must register no later than one week prior to the first day of class.

Information about state certification requirements may be obtained from the certification officer or graduate faculty advisors.

Student Programs of Study

All programs of study must be planned with an advisor. In granting approval, the advisor will consider the student's previous academic record and whether the prerequisites set forth for the specific program have been met. Should a student wish to change his or her track or concentration, this request must be made in writing and approved by the advisor and the dean.

Academic Freedom and Responsibility

The statement on academic freedom, as formulated in the 1940 Statement of Principles endorsed by the AAUP (American Association of University Professors) and incorporating the 1970 interpretive comments, is the policy of Fairfield University. Academic freedom and responsibility are here defined as the liberty and obligation to study, to investigate, to present and interpret, and discuss facts and ideas concerning all branches and fields of learning. Academic freedom is limited only by generally accepted standards of responsible scholarship and by respect for the Catholic commitment of the institution as expressed in its mission statement, which provides that Fairfield University "welcomes those of all beliefs and traditions who share its concerns for scholarship, justice, truth, and freedom, and it values the diversity which their membership brings to the university community."

Freedom of Expression

As an academic institution, Fairfield University exists for the transmission of knowledge, pursuit of truth, development of students, and the general well-being of society. Free inquiry and free expression are indispensable to the attainment of these goals. Fairfield University recognizes that academic freedom, freedom of expression, and responsibility are required to realize the essential purposes of the University. Academic freedom and responsibility (distinguished from freedom of expression) are herein defined as the liberty and obligation to study, to investigate, to present, interpret, and discuss facts and ideas concerning all branches and fields of inquiry.

Student Rights

As constituents of the academic community, students should be free, individually and collectively, to express their views on issues of institutional policy and on matters of general interest to the student body.

Fairfield University students are both citizens and members of the academic community. As citizens of a private institution, Fairfield's students enjoy the same freedom of speech, peaceful assembly, and right of petition that students at other private institutions enjoy as accorded by law, and as members of the academic community, they are subject to the obligations which accrue to them by virtue of this membership. Faculty members and administration officials should ensure that institutional powers are not employed to deprive students of their rights as accorded to them by law and University policy. At the same time, the institution has an obligation to clarify those standards which it considers essential to its educational mission and its community life. These expectations and regulations should represent a reasonable regulation of student conduct.

As members of the academic community, students should be encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. They do this within the requirements of the curriculum and the courses in which they are enrolled.

The professor in the classroom and in conference should encourage free discussion, inquiry, and expression. Student performance should be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards. This means that students are free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled. Students in professional programs are expected to understand and uphold the standards required in their profession.

Students bring to the campus a variety of interests previously acquired and develop many new interests as members of the academic community. They should be free to organize and join associations to promote their common interests. Students and student organizations should be free to examine and discuss all questions of interest to them and to express opinions publicly and privately. Students should be allowed to invite and to hear any person of their own choosing. Those procedures required by an institution before a guest speaker is invited to appear on campus should be designed only to ensure that there is orderly scheduling of facilities and adequate preparation for the event, and that the occasion is conducted in a manner appropriate to an academic community. Guest speakers are subject to all applicable laws, and to the University policies on harassment and discrimination.

Students should always be free to support causes by orderly means which do not disrupt operations of the institution. At the same time, it should be made clear to the academic and larger community that in their public expressions or demonstrations, students or student organizations speak only for themselves and not the institution.

Student Responsibilities

Freedom of expression enjoyed by students is not without limitations. The rights set forth herein must be balanced against and considered in the context of the following responsibilities:

- Students have the obligation to refrain from interfering with the freedom of expression of others.
- Students have the responsibility to respect the rights and beliefs of others, including the values and traditions of Fairfield University as a Jesuit, Catholic institution.
- Students have the responsibility to support learning, and when learning, to engage others in a respectful dialogue, to never threaten the safety or security of others, and to comply with all University policies prohibiting harassment, hate crimes, and discrimination.

All policies in this catalog and the actions taken under them must support Fairfield University's Mission Statement and the Statement on Academic Freedom.

Academic Honesty

All members of the Fairfield University community share responsibility for establishing and maintaining appropriate standards of academic honesty and integrity. As such, faculty members have an obligation to set high standards of honesty and integrity through personal example and the learning communities they create. It is further expected that students will follow these standards and encourage others to do so.

Students are sometimes unsure of what constitutes academic dishonesty. In all academic work, students are expected to submit materials that are their own and to include attribution for any ideas or language that is not their own. Examples of dishonest conduct include but are not limited to:

- Falsification of academic records or grades, including but not limited to any act of falsifying information on an official academic document, grade report, class registration document or transcript.
- Cheating, such as copying examination answers from materials such as crib notes or another student's paper.
- Collusion, such as working with another person or persons when independent work is prescribed.
- Inappropriate use of notes.
- Falsification or fabrication of an assigned project, data, results, or sources.
- Giving, receiving, offering, or soliciting information in examinations.
- Using previously prepared materials in examinations, tests, or quizzes.
- Destruction or alteration of another student's work.
- Submitting the same paper or report for assignments in more than one course without the prior written permission of each instructor.
- Appropriating information, ideas, or the language of other people or writers and submitting it as one's own to satisfy the requirements of a course - commonly known as plagiarism. Plagiarism constitutes theft and deceit. Assignments (compositions, term papers, computer programs, etc.) acquired either in part or in whole from commercial sources, publications, students, or other sources and submitted as one's own original work will be considered plagiarism.
- Unauthorized recording, sale, or use of lectures and other instructional materials.

In the event of such dishonesty, professors are to award a grade of zero for the project, paper, or examination in question, and may record an F for the course itself. When appropriate, expulsion may be recommended and a notation of the event is made in the student's file in the academic dean's office. The student will receive a copy.

Honor Code

Fairfield University's primary purpose is the pursuit of academic excellence. This is possible only in an atmosphere where discovery and communication of knowledge are marked by scrupulous, unqualified honesty. Therefore, it is expected that all students taking classes at the University adhere to the following Honor Code:

"I understand that any violation of academic integrity wounds the entire community and undermines the trust upon which the discovery and communication of knowledge depends. Therefore, as a member of the Fairfield University community, I hereby pledge to uphold and maintain these standards of academic honesty and integrity."

University Course Numbering System

Undergraduate

01-99	Introductory courses
100-199	Intermediate courses without prerequisites
200-299	Intermediate courses with prerequisites
300-399	Advanced courses, normally limited to juniors and seniors, and open to graduate students with permission

Graduate

400-499	Master's and Certificate of Advanced Study courses, open to undergraduate students with permission
500-599	Master's and Certificate of Advanced Study courses
600-699	Doctoral courses, open to qualified Master's students

Option for Graduate Level Courses

Undergraduates with permission could take a graduate course for undergraduate credit and as part of their undergraduate load. It would appear on their undergraduate transcript. A student could later petition to have those courses provide advanced standing in their graduate program and it would be up to the faculty to determine if the credits should apply to the graduate program at that point. Student might receive credit for these courses as part of a graduate program if the student did not apply the credits to complete the undergraduate degree.

An undergraduate student who has advanced beyond degree requirements and also has permission could take a graduate level course for graduate credit as part of their regular undergraduate load. The number of graduate courses a full time undergraduate could take would be limited to two. The five year pre-structured programs would follow their own required sequence.

Registration for graduate courses is on a space available basis, with preference given to graduate students. Undergraduates with permission to enroll in a graduate course may petition to register in late August for the fall and early January for the spring.

Normal Academic Progress

Academic Load

A full-time graduate student will normally carry nine credits during the fall or spring semester. Twelve credits is the maximum load permitted. During summer sessions, full-time students are permitted to carry a maximum load of 12 credits. Students who work full time or attend another school may not be full-time students. Such individuals are ordinarily limited to six credits during the fall or spring semesters and nine credits during the summer sessions.

Academic Standards

Students are required to maintain satisfactory academic standards of scholastic performance. Candidates for a master's degree or certificate must maintain a 3.00 grade point average.

Auditing

A student who wishes to audit a graduate course may do so only in consultation with the course instructor. A Permission to Audit form, available at the dean's office, must be completed and presented at registration during the regular registration period. No academic credit is awarded and a grade notation (AU) is recorded on the official transcript under the appropriate semester and course name. The tuition for auditing is one-half of the credit tuition, except for those hands-on courses involving the use of a computer workstation. In this case, the audit tuition is the same as the credit tuition. Conversion from audit to credit status will be permitted only before the third class and with the permission of the course instructor.

Independent Study

The purpose of independent study at the graduate level is to broaden student knowledge in a specific area of interest. Students must submit a preliminary proposal using the Independent Study Application form, which is available in the dean's office, to the major advisor. Frequent consultation with the major advisor is required. Students may earn from one to six credits for an independent study course.

Matriculation/Continuation

To remain in good academic standing, a student must achieve a 3.00 cumulative quality point average upon completion of the first 12 semester hours. A student whose cumulative quality point average falls below 3.00 in any semester is placed on academic probation for the following semester. Students on academic probation must meet with their advisors to program adjustments to their course load. If, at the end of the probationary semester, the student's overall average is again below 3.00, he or she may be dismissed.

Time to Complete Degree

Students are expected to complete all requirements for the M.A. and M.S. programs within five years after beginning their course work. Each student is expected to make some annual progress toward the degree orcertificate to remain in good standing. A student who elects to take a leave of absence must submit a request, in writing, to the dean.

Applications for and Awarding of Degrees

All students must file an application for the master's degree in the dean's office by the published deadline. Graduate students must successfully complete all requirements for the degree in order to participate in commencement exercises. Refer to the calendar for the degree application deadline.

Graduation and Commencement

Diplomas are awarded in January, May, and August (see calendar for application deadlines). Students who have been awarded diplomas in the previous August and January, and those who have completed all degree requirements for May graduation, are invited to participate in the May commencement ceremony. Graduate students must successfully complete all requirements for the degree in order to participate in commencement.

Course Grading System

Grades; Academic Average

The work of each candidate is graded on the following basis:

A	4.00
A-	3.67
B+	3.33
B	3.00
B-	2.67
C+	2.33
C	2.00
F	0.00
I	Incomplete
W	Withdrew without penalty

The grade of incomplete is given at the discretion of individual professors. All coursework must be completed within 30 days after the last class in the course for which a student has received an incomplete grade, after which the "I" becomes an F.

No change of grade will be processed after a student has graduated. Any request for the change of an earned letter grade is at the discretion of the original teacher of the course and must be recommended in writing to the dean by the professor of record within one calendar year of the final class of the course or before graduation, whichever comes first.

A student may request an extension of the one-year deadline from the dean of their school if he or she can provide documentation that extenuating circumstances warrant an extension of the one-year deadline. Such an extension may be approved only if the professor of record agrees to the extension and an explicit date is stipulated by which the additional work must be submitted.

A student who elects to withdraw from a course must obtain written approval from the dean. Refunds will not be granted without written notice. The amount of tuition refund will be based upon the date the notice is received. Fees are not refundable unless a course is canceled.

Multiplying a grade's numerical value by the credit value of a course produces the number of quality points earned by a student. The student's grade point average is computed by dividing the number of quality points earned by the total number of credits completed, including failed courses. The average is rounded to the nearest second decimal place.

A change of an incomplete grade follows the established policy.

Incomplete

An incomplete grade is issued in the rare case when, due to an emergency, a candidate makes arrangements in advance and with the professor's and the dean's permission to complete some of the course requirements after the semester ends. All course work must be completed within 30 days of the end of the term. Any incomplete grade still outstanding after the 30-day extension will become an F and the candidate may be excluded from the program.

Transfer of Credit

Transfer of credit from another approved institution of higher learning will be allowed if it is graduate work done after the completion of a bachelor's program and completed prior to entering Fairfield University.

No more than six credits may be transferred. Transfer credit will be considered for graduate coursework earned with a grade of B or better. An official transcript of the work done must be received before a decision will be made on approving the transfer.

Grade Reports

Grade reports for all graduate students are issued electronically by the Registrar via the student's web portal (StagWeb) at the end of each semester.

Scholastic Honors

Alpha Sigma Nu

Alpha Sigma Nu, the national Jesuit honor society, serves to reward and encourage scholarship, loyalty, and service to the ideals of Jesuit higher education. To be nominated for membership, graduate students must have scholastic rank in the top 15 percent of their class, demonstrate a proven concern for others, and manifest a true concern and commitment to the values and goals of the society. The Fairfield chapter was reactivated in 1981 and includes outstanding undergraduate and graduate students who are encouraged to promote service to the University and provide greater understanding of the Jesuit ideals of education.

Disruption of Academic Progress

Academic Probation/Dismissal

A student whose overall grade point average falls below 3.00 in any semester is placed on probation for the following semester. If the overall grade point average is again below 3.00 at the end of that semester, the student may be dismissed. Any student who receives two course grades below 2.67 or B- will be excluded from the program.

Course Withdrawal
Students who wish to withdraw from a 14- to 15-week course before its sixth scheduled class must do so in writing or in person at the Registrar's Office. Written withdrawals are effective as of the date received or postmarked. In-person withdrawals are made in the Registrar's Office by completing and submitting a Change of Registration form.

Those who wish to withdraw from a course after the sixth scheduled class must submit a written statement of their intention to the dean for approval to withdraw without academic penalty. Failure to attend class or merely giving notice to an instructor does not constitute an official withdrawal and may result in a penalty grade being recorded for the course. In general, course withdrawals are not approved after the sixth scheduled class. In extreme cases, exceptions may be approved by the dean.

Continuous Registration
Graduate students matriculated in a degree program who choose to interrupt their education for a given term must file for Continuous Registration status with the Registrar's Office in order to maintain their active student status. Continuous Registration allows students use of the library, computing facilities and access to faculty advising. Students may remain on Continuous Registration status for up to two successive terms. Students who do not register for Continuous Registration status will be assumed to be inactive. Students deemed inactive are required to secure reinstatement from the dean in order to continue their enrollment.

Readmission
If a student has been inactive for three terms or longer, students must submit a written update to the dean for reinstatement. Depending on the individual circumstances it may be necessary to complete a full application for admission. A review of past work will determine the terms of readmission.

Academic Grievance Procedures

Purpose
Procedures for review of academic grievances protect the rights of students, faculty, and the University by providing mechanisms for equitable problem solving.

Types of Grievances
A grievance is defined as a complaint of unfair treatment for which a specific remedy is sought. It excludes circumstances that may give rise to a complaint for which explicit redress is neither called for nor sought, or for which other structures within the University serve as an agency for resolution.

Academic grievances relate to procedural appeals or to academic competence appeals, or to issues of academic dishonesty. Procedural appeals are defined as those seeking a remedy where no issue of the quality of the student's work is involved. For example, a student might contend that the professor failed to follow previously announced mechanisms of evaluation.

Academic competence appeals are defined as those seeking a remedy because the evaluation of the quality of a student's work in a course is disputed. Remedies would include but not be limited to awarded grade changes, such as permission to take make-up examinations or to repeat courses without penalty.

Academic dishonesty appeals are defined as those seeking a remedy because of a dispute over whether plagiarism or cheating occurred. Remedies would include but not limited to removal of file letter, change of grade, or submitting new or revised work.

Time Limits
The procedures defined here must be initiated within one semester after the event that is the subject of the grievance.

Informal Procedure
Step one: The student attempts to resolve any academic grievance with the faculty member, department chair, or other individual or agency involved. If, following this initial attempt at resolution, the student remains convinced that a grievance exists, she or he advances to step two.

Step two: The student consults the chair, or other individuals when appropriate, bringing written documentation of the process up to this point. If the student continues to assert that a grievance exists after attempted reconciliation, he or she advances to step three.

Step three: The student presents the grievance to the dean of the school in which the course was offered, bringing to this meeting documentation of steps one and two. If the dean's attempts at mediation prove unsuccessful, the student is informed of the right to initiate formal review procedures.

Formal Procedure
Step one: If the student still believes that the grievance remains unresolved following informal procedures, she or he initiates the formal review procedure by making a written request through the dean of the school in which the course was offered for a formal hearing in the Senior Vice President for Academic Affairs' office. Such a request should define the grievance and be accompanied by documentation of completion of the informal process. It should also be accompanied by the dean's opinion of the grievance.

Step two: The Senior Vice President for Academic Affairs determines whether the grievance merits further attention. If not, the student is so informed.

If, however, the grievance does merit further attention, the Senior Vice President for Academic Affairs determines whether it is a procedural, competence, or academic dishonesty appeal.

- If it relates to a procedural matter, the Senior Vice President for Academic Affairs selects a dean (other than the dean of the involved school) to chair a grievance committee.
- If it relates to an academic competence matter, the Senior Vice President for Academic Affairs requests from the dean involved the names of two outside experts to serve as a consultant panel in determining the merit of the student's grievance.
- If it relates to academic dishonesty, the Senior Vice President for Academic Affairs will convene a committee comprised of a dean and two faculty from outside the department in which the course was offered to review the material and the sanctions.

In addition, in some instances it may be possible for the Senior Vice President for Academic Affairs to settle the grievance.

Step three: For procedural appeals, the grievance committee takes whatever steps are deemed appropriate to render a recommendation for resolving the grievance. The committee adheres to due process procedures analogous to those in the Faculty Handbook.

For competence appeals, the Senior Vice President for Academic Affairs contacts the outside panel members and requests that they review the case in relation to its content validity.

For academic honesty appeals, the Senior Vice President for Academic Affairs will request that the committee present a written report of its findings relating to the validity of the charge and the sanctions.

Step four: The recommendation from either the grievance committee or the panel is forwarded to the Senior Vice President for Academic Affairs in written form, accompanied, if necessary, by any supporting data that formed the basis of the recommendation.

Step five: The Senior Vice President for Academic Affairs renders a final and binding judgment, notifying all involved parties. If the grievance involves a dispute over a course grade given by a faculty member, the Senior Vice President for Academic Affairs is the only University official empowered to change that grade, and then only at the recommendation of the committee or panel.

Structure of the Grievance Committee
The structure of the Grievance Committee is the same as the existing Academic Honesty Committee, as follows:

- Two faculty members are selected from a standing panel of eight faculty members elected by the general faculty. The faculty member against whom the grievance has been directed proposes four names from that panel; the student strikes two of those names, and the two remaining faculty members serve.
- Two students are selected from a standing panel of eight students elected by the student government. The student grievant proposes four names from that panel; the faculty strike two of those names; the two remaining students serve.
- In the event that a faculty member or student selected through the foregoing process is unable to meet, another elected member of the panel serves as an alternate.
- The committee is chaired by a dean (other than the dean of the school in which the course was offered) to be selected by the Senior Vice President for Academic Affairs. The dean so selected has no vote except in the event of a tie, and is responsible for overseeing the selection of the review committee, convening and conducting the committee meetings, and preparing the committee's report(s) and other appropriate documentation.
- The election of committee members should take into account the possible need for response on 24-hour notice (particularly at the time of Commencement), and availability should, in such instances, be a prime consideration in committee member selection.

Due Process Procedure
a. Both the student and the faculty member have the right to be present and to be accompanied by a personal advisor or counsel throughout the hearing.

b. Both the student and the faculty member have the right to present and to examine and cross-examine witnesses.

c. The administration makes available to the student and the faculty member such authority as it may possess to require the presence of witnesses.

d. The hearing committee promptly and forthrightly adjudicates the issues.

e. The full text of the findings and conclusions of the hearing committee are made available in identical form and at the same time to the student and the faculty member. The cost is met by the University.

f. In the absence of a defect in procedure, recommendations shall be made to the Senior Vice President for Academic Affairs by the committee as to possible action in the case.

g. At any time should the basis for an informal hearing appear, the procedure may become informal in nature.

Transcripts

Graduate transcript requests should be made in writing to the University Registrar's Office in the Kelley Center. There is a $4 fee for each copy (faxed transcripts are $6). Students should include the program and dates that they attended in their requests. In accordance with the general practices of colleges and universities, official transcripts with the University seal are sent directly by the University. Requests should be made one week in advance of the date needed. Requests are not processed during examination and registration periods.

Student Records

Under the Family Educational Rights and Privacy Act passed by Congress in 1974, legitimate access to student records has been defined. A student at Fairfield University, who has not waived that right, may see any records that directly pertain to the student. Excluded by statute from inspection is the parents' confidential statement given to the financial aid office and medical records supplied by a physician.

A listing of records maintained, their location, and the means of reviewing them is available in the dean's office. Information contained in student files is available to others using the guidelines below:

1. Confirmation of directory information is available to recognized organizations and agencies. Such information includes name, date of birth, dates of attendance, address.
2. Copies of transcripts will be provided to anyone upon written request of the student. Cost of providing such information must be assumed by the student.
3. All other information, excluding medical records, is available to staff members of the University on a need-to-know basis; prior to the release of additional information, a staff member must prove his or her need to know information to the office responsible for maintaining the record.

The School of Engineering

MASTER OF SCIENCE IN ENGINEERING MANAGEMENT OF TECHNOLOGY (MSMOT)

Introduction

The MSMOT program at Fairfield University serves the needs of professional technologists, engineers and managers in their progression into management-level positions. The program instructs and trains engineers and scientists, and motivated people from any discipline who have a need to make management decisions in a technology environment or will be involved in the management of such functions as technology research and development, product design, manufacturing, human and physical resources, product and system test, information and data analysis, and product and service support.

The program is intended for technologists and those involved in technology-dependent enterprises who aspire to favorably position their companies in fast-paced markets, influence crucial decision-making in pursuing new technologies and improve the likelihood of corporate success. Graduates of the program are able to help their organizations embrace technology innovation in a timely fashion, focusing the energy of their companies on translating research and development efforts rapidly and effectively into manufacturing strategies and products that satisfy market needs.

MSMOT Mission

To prepare managers and leaders with the skills and competencies that will prepare them to

- Understand, manage and lead organizations,
- Embrace technology innovation to remain competitive,
- Translate technology into business terms to result in richer business decisions, and a higher likelihood of breakthrough business performance.
- Assess, develop and apply solutions to the challenges confronting organizations in today's global economy.

Program Overview

This two-year graduate degree program is designed to enhance your technical experience with advanced management and leadership skills. The program addresses the needs of the technically trained employee who must use business principles across the entire gamut of engineering disciplines. The non-technically trained person will also benefit from this program as business management has become intertwined with technology. Learning the skills this program affords will help prepare you to manage the domestic and global resources and processes required in today's business environment.

MSMOT graduates become effective leaders in small and large companies, providing creative guidance to the development and/or adoption and marketing of technology products and services. Specific program objectives include the following:

- To train the technically proficient by adding to their skills a deeper comprehension of business planning and economics, and an understanding of global markets, thereby empowering them to develop entrepreneurial skills. Technologists who are, or aspire to be employed as managers or supervisors and who currently engage in technology planning and development will be immersed in an educational program that integrates studies in technology management with modern management principles and practices.
- To enhance the skills of technologists in the design and manufacturing disciplines, in the management and effective use of information resources, and in the developing strategies that are crucial to effective leadership in technological entrepreneurship.
- To provide graduates in engineering, science and other disciplines with the opportunity to pursue a graduate program that expands their career paths and ultimately leads to leadership roles in the management of technology-dependent businesses.
- To provide technology-dependent business and industry enterprises in Connecticut with people skilled in the management of technology and capable of enhancing the strength and competitiveness of those businesses. The outcome will serve to enrich the entrepreneurial climate in the state.
- To learn the skills relevant to today's competitive global environment where technology is increasingly a core competency of all organizations.

As a consequence of participating in this degree experience, the student will gain the following specific learning outcomes:

- Identify, prioritize, and solve technical and management related problems through analysis, synthesis, and evaluative processes.
- Understand how to plan, organize, lead, and control within an organizational setting.
- Interact with team members and/or work groups to achieve a common goal.
- Increase their individual knowledge and understanding of group and team interactions, and their impact upon business productivity, efficiency, and effectiveness.
- Recognize the skills and techniques needed for problem solving and decision making.
- Communicate effectively both orally and in writing.

- Understand basic accounting methods and their business applications.
- Use financial analysis within a business environment.
- Apply the strategic management process to an analysis of the business environment and make recommendations on preferred courses of action.
- Recognize ethical issues in the management of technology and in the decision making process in business and industry; and stimulate the student's sense of responsibility and help them deal with ambiguity.

Almost all of the MSMOT faculty have been engineers, managers and leaders in industry. Some have started their own companies. They know what it takes to succeed in the business world. They stand ready to help you move your career into overdrive with the new skills and competencies that you will gain.

Students

The MSMOT program is designed to accommodate students who wish to attend on a full-time or part-time basis. The program is directed toward the following student groups: (a) engineers and scientists who need skills in critical thinking and decision-making to effectively guide the technology that will enhance product and service quality and their employer's business opportunities; (b) professionals who are charged with implementing technology initiatives in order to effectively compete in the 21st century with a lead over their competitors; (c) managers of technical and business activities responsible for creating strategic business plans and overseeing their execution; (d) research and development practitioners who require skills to recognize relevant technologies developed outside their own business organization and who must judge the merits of investing in them; (e) engineers and scientists who aspire to careers in management and require the knowledge to systematically integrate technology into their company's activity; (f) engineers and scientists interested in academic careers combining science, engineering, and management; and (g) technologists who require broad management skills to provide leadership in business.

The program does not require GRE or other standardized testing. International students must take either the TOEFL or the IELTS exam.

The MSMOT Curriculum

The MSMOT program offers courses affording students the opportuity to establish the foundations of technology management, and then choose a set of electives that best reflects their interests. Of these courses, several are in the School of Business MBA program. A total of 12 courses, including the two-term capstone course, will earn a student the Master's degree. Entering students are required to have an adequate background in probability and statistics, computer programming using at least one higher order language, and financial accounting. Complete matriculation into MSMOT program, requires that the student have knowledge in the following areas:

BR 1	Probability and Statistics
BR 2	Computer Programming with a High-Level Language with Applications
BR 3	Financial Accounting

Students who have not completed courses in these areas may be admitted to the program provisionally and must complete these courses as early as possible in their program.

Degree Requirements

The degree requires the completion of a minimum of 12 three-credit courses (36 total credits) as indicated below. The designations (B) and (E) following a course name indicate courses offered through the School of Business or the School of Engineering, respectively. Students pursuing the MSMOT degree in the School of Engineering may take a maximum of five courses from the MBA curriculum in the Charles F. Dolan School of Business.

Required Courses - 24 credits

All MSMOT students are required to complete each of the following three-credit courses except where alternatives are approved by the program director.

AC 500	Accounting for Decision-Making (B)
DM 460	Project Management (E)
GK 415	Information Systems (E)
MG 508	Strategic Management of Technology and Innovation (B)
MG 584	Global Competitive Strategy (B)
OR	
RD 500	An Introduction to Systems Engineering (E)
RD 460	Leadership in Technical Enterprise (E)
CP 551	Capstone I Project Definition and Planning (E)
CP 552	Capstone II Project Execution and Results (E)

Of particular note among the required courses is the sequence of CP 551 and CP 552 courses, which constitute the MSMOT capstone, a team-driven effort to define and design realizable solutions to real-world technical/business projects. The capstone courses are supervised by faculty mentors.

Elective Courses - 12 credits

In addition to the required courses, students must complete four elective courses. MSMOT students may elect to enroll in graduate courses in any discipline within the University that will assist them in meeting their career objectives. Students may, if they choose, take courses in concentration areas such as Management of Design and Manufacturing, Strategic Management of Resources, Management of Information Technology, Systems Engineering Concepts and Methods, and

health care. Representative concentrations and course electives are shown below:

Management of Design and Manufacturing

DM 405 Supply Chain Design (E)
DM 407 Design of Manufacturing Systems and Processes (E)
DM 420 Design for Economy and Reliability (E)
DM 430 Management of Design for Automation (E)

Management of Resources

MG 584 Global Competitive Strategy (B)
RD 450 Management of Risk in Research and Development (E)
RD 485 Management of Intellectual Property (E)

Management of Information Technology

SW 400 Software Engineering Methods (E)
SW 402 Database Concepts (E)
SW 508 Data Warehouse Systems (E)
SW 518 Data Mining and Business Intelligence (E)

Systems Engineering Concepts and Methods

RD 500 An Introduction to Systems Engineering (E)
RD 525 Principles of Quality Management (E)

Other Elective Courses

MSMOT students may also select any of the courses listed below, or graduate courses offered through the School of Engineering (mechanical engineering, software engineering, and electrical and computer engineering) or in the School of Business. Consult the MOT program director to discuss your specific needs.

MG 500 Managing People for Competitive Advantage (B)
MG 503 Legal and Ethical Environments of Business (B)
MK 400 Marketing Management (B)
OM 400 Integrated Business Processes (B)
SW 404 Network Concepts (E)
SW 530 Introduction to Information Security (E)
SW 531 Applications and Data Security (E)
SW 406 Web Client-Side Development I (E)
SW 408 Java for Programmers I (E)
SW 512 Web Development II with ASP.NET (E)
SW 409 JAVA for Programmers II (E)
SW 410 Enterprise Java (E)
SW 505 Advanced Database Concepts (E)

MASTER OF SCIENCE IN ENGINEERING MECHANICAL ENGINEERING (MSME)

Introduction

The MSME program is designed as a course of study to provide graduate engineers with a deeper and broader understanding of the methods and skills in the area of mechanical engineering. For this purpose, the proposed program will incorporate knowledge across three Mechanical Engineering domains, and will also take advantage of the other master's degree programs in Electrical and Computer Engineering, Software Engineering, and Management of Technology in the School of Engineering.

The program outcomes are achieved through knowledge and skills that students gain by virtue of expert curriculum design, instruction in an effective learning environment, and opportunities for inquiry and professional development.

Students will have the option to specialize in one of the following broad ME domains:

- Energy, Fluids and Thermal Systems: This domain includes instruction in renewable energy, energy conversion, turbomachinery, gas dynamics, heat and mass transfer.
- Dynamics, and Control Systems: This domain includes courses in vibrations, advanced kinematics, advanced dynamics and control systems.
- Mechanics, Manufacturing and Automation: This domain spans the topics of advanced materials, fracture mechanics manufacturing and automation.

Students will be able to identify, formulate, and solve advanced mechanical engineering problems. They will also be able to use the techniques, skills, and modern analytical and software tools necessary for the mechanical engineering practice. Sequences of electives, as well as a master's Project/Thesis, will assist in achieving the program's learning goals.

Program Overview

The aim of the MSME program is to achieve the following basic objectives:

- Students will be educated in methods of advanced engineering analysis, including the mathematical and computational skills required for advanced problem solving. They will be trained to develop the skills and the ability to formulate solutions to problems, to think independently and creatively, to synthesize and integrate information/data, and to work and communicate effectively.
- Students will be provided with in-depth knowledge in the domains of study that will allow them to apply innovative techniques to problems and utilize the tools they need to focus on new applications. Sequences of electives, as well as a master's thesis, will provide depth in their learning experiences.
- Students will avail themselves of a breadth of knowledge that fosters an awareness of and skills for interdisciplinary approaches to engineering problems.
- Undergraduate students in mechanical, aerospace, civil, chemical, industrial, and manufacturing engineering have the opportunity to pursue, upon completion of their undergraduate studies, a graduate program that would allow them broader career paths and leadership roles in the mechanical engineering area. Students outside the above engineering fields will be assigned to take specific bridge courses in their area of specialization interest to meet the course prerequisite.

Students

Mechanical engineering is a highly diverse discipline that ranges from the aesthetic aspects of design to highly technical research and development. The student population for the MSME program has several origins. Typical examples are as follows:

- Engineers and scientists who, responding to the specific needs of their industry across the spectrum of special domains listed above, need to acquire skills so that they may effectively guide the development of technologies which will enhance product quality and business opportunities
- Engineers and scientists who wish to fulfill their need for personal and professional growth in the mechanical engineering domain
- Engineers who aspire to academic careers and those who wish to eventually continue their studies toward a Ph.D. degree
- Engineers aspiring to a career change
- Current undergraduate engineering students and alumni who desire an opportunity to continue their studies for an advanced engineering degree at Fairfield University

The MSME Curriculum

The MSME program offers two options for graduation: (a) a thesis option which requires 33 credits, including the two-term thesis, and (b) the non-thesis option which requires 36 credit hours.

Required Courses

In both options, the program entails five required courses as follows:

MC 400 Feedback and Control Systems
ME 451 Energy Conversion
SW 408 Java for Programmers
OR
SW 403 Visual C# for Programmers I
OR
SW 427 Object-Oriented Programming with C++
ME 425 Engineering Applications of Numerical Methods
ME 470 Applications of Finite Element Analysis

Thesis Option

Students may choose the thesis option provided they select an academic advisor and secure the approval of the program director.

In the event that a student in the thesis track wishes to switch to the non-thesis option, credits that might have been earned in the pursuit of a thesis will not count toward fulfilling the graduation requirement.

Core Concentration Courses

Students select seven courses from the core concentration list below, from which up to three courses may be taken from other graduate engineering courses related to their field of interest. The objective of the core concentration courses is to provide students with areas of in-depth study, which are at the core of their major interests and career objectives. These major courses are recommended for setting the foundations for specialization in a functional area of mechanical engineering. The core concentration courses are as follows:

1. **Energy, Fluids and Thermal Systems:** This domain considers the broad areas of energy and turbomachinery, fluid dynamics and heat transfer. It includes study of conduction, convection, radiation, compressible and heated flows, combustion, and laminar and turbulent flows. Applications in design and analysis, processes and devices, fuel cells, heat pipes, gas turbines and renewable energy are considered. The courses offered are:

ME 450 Gas Dynamics
ME 452 Heat and Mass Transfer
ME 453 Turbomachinery
ME 428 Computational Fluid Dynamics

2. **Dynamics, and Control System:** The courses in this domain cover the broad areas of mechanical and dynamic systems. More specifically, the focus includes, but is not limited to, the dynamic behavior of mechanisms, machines, and mechanical systems, and vibration analysis and machine dynamics. Research methods include a blend of techniques involving mathematics and computer simulation. The courses are:

ME 410 Vibration Analysis
ME 411 Advanced Kinematics
ME 412 Advanced Dynamics

3. **Mechanics, Manufacturing and Automation**: The courses in this domain focus on solving problems in engineering materials and manufacturing, and include material behavior, computer integrated design and manufacturing, applications in machinery, mechanical systems design and automation. These courses are:

ME 427 Applications of Fracture Mechanics in Engineering Design
ME 444 Mechanics of Composite Material
MF 440 Computer Aided Manufacturing (CAM)
MF 461/462 Automation and Robotics I/II
MF 450 Advanced Programmable Logic Control Systems
RD 525 Principles of Quality Management

Additional Courses

ME 495 Independent Study
ME 496 Special Projects
ME 550 Thesis I
ME 551 Thesis II

Graduate Certificate Program in Automated Manufacturing

A certificate program in Automated Manufacturing Engineering is also available for practicing engineers with at least three years experience in a manufacturing environment.

The course of study for the Certificate in Automated Manufacturing Engineering includes a four-course sequence chosen from the following list of courses:

DM 405 Supply Chain Design
DM 430 Management of Design for Automation
MF 440 Computer Aided Manufacturing (CAM) II
MF 450 Programmable Logic Control Systems
MF 454 Product and Process Design for Manufacturing
MF 461 Automation and Robotics I
MF 462 Automation and Robotics II

MASTER OF SCIENCE IN ENGINEERING SOFTWARE ENGINEERING (MSSE)

Introduction

The School of Engineering offers a master's degree in software engineering (MSSE) as well as graduate-level certificate programs in select areas of software engineering. The MSSE program is intended to serve the needs of software application developers, web programmers, network and information security administrators, database administrators, and other information technology professionals. Students who do not meet a minimum experience level, or who have other skill deficiencies, will be required to take one or more bridge courses to strengthen their capacity to meet the MSSE curriculum demands.

The certificate programs allow software professionals to upgrade their skills in selected areas. Certificate program students enroll under "special student" status and participate in courses offered through the MSSE program, earning a Certificate of Completion. The certificate credits could count toward the MSSE degree should students choose to pursue it. Four certificate programs are available: Web Applications Development, Database Management, Information Security, and Network Technologies.

Program Overview

Engineering education programs seek to impart technical, mathematical, and engineering design knowledge that can be applied to the creative development of products, or solutions to problems, that are useful to society. The MSSE program emphasizes software as the product to be built, recognizing that social progress and the national economy depend on knowledge industries as well as on traditional manufacturing, and aims to meet the challenge of progressively increasing demand for the skills and competencies of software engineers.

A special feature of the MSSE program at Fairfield is a team-driven software engineering capstone course during which students experience the various phases of the software engineering development lifecycle while working on significant software development projects chosen by the faculty. The criteria for the projects are that they are complex, allow the students to experience advanced software engineering topics, and are multi-semester long with students joining for two semesters each.

Learning Goals

Students in the MSSE program will be instructed to analyze, design, verify, validate, implement, apply, and maintain software systems. Specifically, the following methodologies and skills will be emphasized:

- Requirements gathering methodologies
- Object-oriented design and prototyping following agile and traditional software life cycles
- Project management in software design and development
- Software system implementation using various software development tools
- Software testing and maintenance
- Software documentation

In sum, students will acquire the skills and real-world knowledge to succeed in the software engineering field through an in-depth exposure to the software development methodologies and tools. A sequence of required courses and elective courses, and the final team-driven capstone project provide depth and breadth to the students' learning experiences.

In addition to required courses, those in specialization areas build strong in-depth technical knowledge and skills in the area of student's interest. Courses in other engineering and management fields are available as electives.

Students

The students who enroll in the MSSE program are:

- IT workers who, responding to the demands of their industry, need to acquire new skills and master new tools to effectively guide software development in their company,
- technologists who wish to fulfill their needs for personal and professional growth,
- engineers and scientists who aspire to a career change,
- undergraduate students in software engineering, computer engineering, or computer science who seek the opportunity to continue their studies for an advanced engineering degree at Fairfield University.

Software is ubiquitous in all modern technology, and software engineers with skills and knowledge of software design, development and management are a valuable resource, and very well-sought after.

Retraining - Special Students
Students who wish to retrain to move from a different discipline into software engineering are welcome to enroll in the program. They may expect to do as many as 12 credits of work to catch up in the field. For example, students with no prior programming experience would be required to take programming language courses under advisement from the program director. Students may also be encouraged to take additional non-credit courses during their graduate work, as needed. These additional prerequisites will be determined on an individual basis.

The MSSE Curriculum

In the course of the MSSE studies, students must become proficient at an advanced level in one programming language. In general this proficiency will be in one of the following languages, Java, C++, or C# as needed. The student must also develop proficiency in one or more database management systems. The required experience can be gained either through coursework or through employment practices.

MSSE students will complete seven required courses, as described below. In addition, students should select one specialization area in which they have an interest, namely computer programming, web technologies, computer networking, and database architecture. Each specialization area consists of three required courses. Students may also take two elective courses offered in any engineering graduate program.

Prerequisites and Foundation Competencies
The MSSE degree requires students to have competencies that will allow them to pursue graduate coursework. Knowledge and/or experience in data structures, applications programming, systems analysis and design, and mathematics is required. Gaps in knowledge and experience in these areas can be remedied by bridge courses that are offered in the undergraduate software engineering program. Before continuing with graduate work, students must correct deficiencies sufficiently to allow them to succeed.

The MSSE Program Requirements

Completion of a minimum of 10 three-credit courses, plus the two-semester capstone or thesis course, for a total of 36 credits, comprise the graduation requirement for the MSSE program.

Required Courses - 21 credits
The program requires two capstone or thesis courses and five required core courses listed below to cover the software project management and software development life cycle of requirements gathering, analysis, design, prototyping, implementation, testing, deployment, and maintenance.

Five required core courses (15 credits) are:

- SW 400 Software Engineering Methods - an exploration of requirements gathering, system analysis, to a specific software project.
- SW 401 Software Design Methods - an exploration of software design, modeling language, design patterns, and prototyping of application to a specific software project.
- SW 409 Java for Programmers II or SW 506 Visual C# for Programmers II - build proficiency at an advanced level in one programming language.
- SW 420 Software Testing and Maintenance - an exploration of software testing and maintenance of the software system.
- SW 421 Software Project Management - an exploration of software project activities from conception to completion based on best practices.

Two options for a two-semester long required course sequence as described below.

Capstone Option, SW 550, SW 551 (6 credits)
The Capstone projects are team driven. The results of these projects provide a library of case studies, designs, and tools that will be of general interest to information technology professionals and organizations in the area.

Students in the Software Capstone Project class are typically organized into teams that contribute to a significant software development project. These projects are chosen to advance the student's knowledge in topics related to the specialization areas. Students consult with their advisors and instructors to determine which projects will contribute most to their education. Students may also suggest projects if they are of sufficient complexity and will advance their knowledge in an area of interest. A capstone topic should be approved by the instructor and accepted by the director of the program prior to starting the capstone sequence.

Thesis Option, SW 560, SW 561 (6 credits)
Students may choose the thesis option at the agreement of a faculty member and approval by the program director.

In the event that a student in one option (Capstone or Thesis) wishes to switch to the other option, the course that was taken in one option will not count toward fulfilling the graduation requirement. Capstone or thesis classes can be taken only after the completion of 18 credits at the minimum.

Specializations / Concentration Courses - 9 credits
A. Computer Programming
This specialization allows professionals to gain a greater understanding of object-oriented programming languages and object-oriented design of software systems. It includes Operating Systems, Algorithms, and Network Programming.

Courses in this area are:
SW 427 Operating Systems and Programming
SW 499 Algorithms
ECE 460 Network Programming

B. Web Technology
This specialization allows professionals to gain a greater understanding of the leading technologies in building web application systems. Coursework focuses upon topics important to the web architect such as Web design, web development, sever management, and web application security. The tools used by the student are the most up to date tools available such as Dreamweaver, Visual Studio, .NET, JBoss, Eclipse, and WebSphere, etc.

Courses in this area are
SW 406 Web Client-Side Development I
SW 512 Web Development II with ASP.NET
SW 410 Enterprise Java
SW 516 High Performance Database Web Applications
SW 448 Server Management
SW 535 Web Application Security

C. Database Architecture
This specialization allows professionals to gain a greater understanding of database architecture and design. It includes modeling, designing, implementation, testing of the complex database with associated software, and database maintenance. Coursework in database architecture focuses on database performance issues, database clusters, distributed databases, data warehousing, data mining, object relational mapping, and information security.

Courses in this area are:
SW 402 Database Concepts
SW 505 Advanced Database Concepts
SW 508 Data Warehouse Systems
SW 518 Data Mining and Business Intelligence

D. Computer Networking
Students get hands-on experience with network system architecture, networking programming, routers and switches, and develop the skills to perform secure network capacity planning and performance monitoring. This course of study combines vendor independent concepts and analytical skills development with work utilizing state of the art equipment from Cisco and Microsoft and other important vendors in the networking industry.

Courses in this area are:
SW 404 Network Concepts
SW 596 Network Routing and Switching
ECE 460 Network Programming
SW 448 Server Management
SW 599 Information Security Measures and Countermeasures

Elective Courses - 6 credits
Electives may be chosen from courses listed under Software Engineering Graduate Certificate Programs, as well as SW 482: Special Topics, and SW 483: Independent Study, or any other Engineering Master level course.

Software Engineering Graduate Certificate Programs
Applicants interested in earning a certificate of advanced study in Software Engineering (12 credits) and those interested in taking selected courses from the Software Engineering curriculum may be admitted on a non-matriculating basis to the School of Engineering as special-status students. Non-matriculated students must have a Bachelor degree from an accredited university and a minimum of three years experience as a professional software developer or programmer, and academic and professional records that suggest the likelihood of success in demanding graduate courses. Non-matriculated students are admitted to courses on a seating-available basis only. Matriculated students are given preference for course offerings, especially for required and core courses.

Web Applications Development Certificate
SW 403 Visual C# for Programmers I
SW 406 Web Client-Side Development I
SW 506 Visual C# for Programmers II
SW 512 Web Development II with ASP.NET
OR
SW 406 Web Client-Side Development I
SW 408 Java for Programmers I
SW 409 Java for Programmers II
SW 410 Enterprise Java

Database Management Certificate
SW 402 Database Concepts
SW 505 Advanced Database Concepts
SW 508 Data Warehouse Systems
SW 518 Data Mining and Business Intelligence

Information Security Certificate
SW 530 Introduction to information Security
SW 531 Applications and Data Security
SW 535 Web Application Security
SW 599 Information Security Measures and Countermeasures

Network Technology Certificate
SW 404 Network Concepts
SW 448 Server Management
SW 596 Network Routing and Switching
SW 599 Information Security Measures and Countermeasures

Note: The sequence of courses SW 404 and SW 596 provides students with the course materials needed to prepare for and take Cisco Certified Network Associate (CCNA) examination. Students who successfully complete SW 404 and SW 596 will be eligible for a voucher for a discount for selected CCNA exams.

MASTER OF SCIENCE IN ENGINEERING ELECTRICAL AND COMPUTER ENGINEERING (MSECE)

Introduction

Electrical and computer engineering at Fairfield University is an inter-disciplinary program that enables its graduates to study several fields including (but not limited to) software systems, hardware systems, nanotechnology and biomedical engineering. The inter-disciplinary nature of the program affords the students a chance to establish an educational identity that is unique. Students can learn topics that include embedded software for real-time microcontrollers, the design of VLSI chips, working with analog sensors, designing mixed signal circuit boards, designing systems that measure and interpret biomedical signals and designing computer-based systems.

An ECE graduate student can focus on topics that can result in a leadership position in a high-technology industry. In a time when the ability to innovate is the only sustainable competitive advantage, an ECE degree unlocks the door to an entrepreneurial career. Our graduates work to design and build products that are based in computer systems, radio frequency or power electronics, biomedical systems or on the interaction between computer systems and biological systems.

The MSECE program takes advantage of elective courses offered by the School of Engineering master's degree programs in mechanical engineering, mathematics, software engineering and management of technology. As a result, students gain technical skills and a sense of the economic and business values needed to employ technology to serve society's needs. Some of our students have selected to participate in business plan competitions and engage in engineering entrepreneurship. We have strong ties to the Inventors Association of Connecticut, the Technology Venture community and local industry as well as the Dolan School of Business.

Program Overview

The MSECE program provides students with the knowledge and skills to innovate and lead in their discipline in the framework of research and development in academic institutions, the industrial workplace, research laboratories, or service organizations. The basic objectives of the MSECE program include the following:

1. Students receive the tools they need to take the lead in creating next generation technologies using fundamental design disciplines. Sequences of electives, as well as a master's thesis, provide depth in their learning experiences.

2. Students gain exposure to the high-tech areas of electrical and computer engineering, including system and product engineering, hardware and software design, embedded systems, communications, control systems, computer architecture, and visualization and multimedia systems. Students have the opportunity to become skilled in creating unique object-oriented designs. State of the art facilities available in the School of Engineering, and close interactions with industry, assist in those tasks.

3. The MSECE program provides undergraduate students with the opportunity to pursue a graduate degree program that broadens their career path, ultimately leading to leadership roles.

Students

Electrical and computer engineering embodies the science and technology of design, implementation, and maintenance of software and hardware components of modern electrical, electronics, computing and network systems. This discipline has emerged from the traditional fields of electrical engineering and computer science. Hence, the student population for the program has several origins. Typical examples include the following:

- Engineers and scientists who, responding to the specific needs of their industry across the spectrum of electrical and computer engineering domains, need to acquire skills to effectively guide the development of technologies that will enhance product quality and business opportunities
- Engineers and scientists who wish to fulfill their needs for personal and professional growth and achieve entrepreneurship in the IT domains
- Engineers aspiring to a career change
- Engineers aspiring to change the world.

In addition to mathematics and science, MSECE graduates have a solid foundation in electronics, logic design, micro-devices, computer organization and architecture, and networking, as well as an understanding of software design, data structures, algorithms, and operating systems.

Graduates are employed in several industries, including the computer, aerospace, telecommunications, power, manufacturing, defense, and electronics industries. They can expect to design high-tech devices ranging from tiny microelectronic integrated-circuit chips to powerful systems that use those chips, and efficient interconnected telecommunication systems. Applications include consumer electronics; advanced microprocessors; peripheral equipment; systems for portable, desktop, and client/server computing; communications devices; distributed computing environments such as local and wide area networks, wireless networks, Internets, Intranets; embedded computer systems; and a wide array of complex technological

systems such as power generation and distribution systems and modern computer-controlled processing and manufacturing plants.

The MSECE Curriculum

Students in the MSECE program must complete either 33 credits, including a thesis, or a non-thesis option comprising 36 credits. Two required courses build a foundation for the discipline; students then choose a core area among ten domains of knowledge and skills to provide depth and specialization in a functional area of electrical and computer engineering. Upon admission, students meet with an advisor to prepare a plan of study that will lead to a master's degree in electrical and computer engineering in the most time-effective manner.

All courses are assigned 3 credits each. Laboratory courses are assigned 1 credit. A minimum of six credit hours is required to complete a domain. For certain domains, a laboratory course is also necessary. Courses taken outside the MSECE Curriculum require written program director approval.

Required courses

SW 408 Java for Programmers I
ECE 415 Engineering Applications of Numerical Methods
ECE 420 Readings in Electrical and Computer Engineering

Thesis Option

ECE 550 Thesis I
ECE 551 Thesis II

Students may continue the thesis option provided they earn an A- or better in the Readings class, ECE 420, and secure the approval of the program director. In the event that a student in the thesis track wishes to switch to the non-thesis option, Thesis I and Thesis II credits that might have been earned in the pursuit of a thesis will not count toward fulfilling the graduation requirement.

Core Courses and Electives

Ten domains of knowledge and skills, shown below, specify available tracks and electives in the MSECE program. This portion of the program provides students with areas of study that are at the core of their major interest and career objectives.

ECE students must complete 6 credit hours from the domain elected for specialization.

ECE Domains

1. **Electronic Product Design.** The courses in this domain cover the nature and properties of materials used in electronic devices and, in particular, management of the thermal environment for the safe operation of the devices.

ECE 405 Electronic Materials
ECE 425 Thermal Management of Microdevices
ECE 448 Embedded Microcontrollers
ECE 448L Embedded Microcontrollers Lab
ECE 510L Product Design Lab

2. **The Architecture of Microelectronics.** The courses in this domain consider the design of analog, digital, and mixed-mode integrated circuits, along with the methods of fabricating high density interconnection structures for manufacturing microelectronic assemblies: thick films, thin films, printed circuit boards and nanotechnology.

ECE 435 Microelectronics
ECE 445 Digital Integrated Circuit Design
ECE 447 Analog Integrated Circuit Design
ECE 515L Microelectronics Lab
ECE 451 Nanoelectronics I
ECE 452 Nanoelectronics II

3. **Systems Design.** This domain includes studies of the fundamentals of linear and nonlinear electric circuits.

ECE 455 Sensor Design and Applications
ECE 457 Advanced Linear Systems
ECE 465 Nonlinear Control Systems
ECE 520L System Design Lab

4. **Communications Systems.** This domain considers the generation and transmission of electromagnetic waves. Structures used in microwave propagation, including transmission lines, waveguides, resonators, and antennas are also considered.

ECE 407 Fiber Optic Transmission and Communication
ECE 407L Fiber Optic Transmission and Communication Lab
ECE 475 Microwave Structures I
ECE 476 Microwave Structures II
ECE 480 Wireless Systems I
ECE 481 Wireless Systems II
ECE 485 Digital Communications
ECE 490 Analog Communications Systems
ECE 525L Communications Systems Lab

5. **Power and Power Electronics.** The courses in this domain consider the design and application of electronic circuits related to power generation, conversion and distribution.

ECE 495 Power Generation and Distribution
ECE 496 Fault Analysis in Power Systems
ECE 505 Advanced Power Electronics
ECE 530L Power Electronics Laboratory

6. **Signal Processing.** This domain covers one-dimensional and two-dimensional signal processing. These

include audio devices like CD players, electronic music synthesizers, sound cards, etc. It also includes image processing applications like machine inspection,remote sensing, and security.

ECE 410 Voice and Signal Processing
ECE 430 Image Processing

7. **Scientific Visualization.** This domain examines the process of converting to a visual form to improve understanding of the data. Applications are in gaming, simulation computational physics, high-energy astrophysics, cosmology, and high-energy physics.

ECE 433 Biomedical Visualization
ECE 440 Computer Graphics
ECE 450 Computer Animation
ECE 460 Network Programming

8. **Embedded Systems.** The embedded systems domain is critical to the creation and deployment of smart systems, which are today embedded in networks that use microchips and computers. Understanding the process by which software and hardware mechanisms allow computations and communications with networks of computers is crucial to this domain.

ECE 406 Advanced Digital Design
ECE 448 Embedded Microcontrollers
ECE 448L Embedded Microcontroller Laboratory
ECE 460 Network Programming
ECE 470 Network Embedded Systems

9. **Enterprise Computing.** The enterprise computing domain addresses the needs of companies based on information technology for their successful operations by providing expertise in server-side application development. This is the enabling technology for deploying business services on the Web; it is further in accord with the new model of Internet services where Web content is replicated in different geographic locations on the Internet for faster accessibility by Web users and Web-based technologies.

SW 402 Database Concepts
SW 410 Enterprise Java

10. **Biomedical Engineering.** The courses in biomedical engineering address the application of engineering principles and techniques to the medical field. It combines the design and problem solving skills of engineering with medical and biological sciences to help improve patient healthcare and the quality of life of individuals.

ECE 431 Biomedical Signal Processing
ECE 432 Biomedical Imaging
ECE 433 Biomedical Visualization

Course Descriptions

MSMOT Course Descriptions

Students in the MSMOT Program are required to complete 12 courses (36 credits). This includes six required courses, two semesters of the Capstone course and four electives. Upon earning 27 credits, students are qualified to take the first of the two Capstone courses. Core courses will be selected from the areas of concentration that are (a) Management of Information Technologies, (b) Management of Design and Manufacturing, and (c) Strategic Management of Resources. The 12 courses should be taken within a five-year period to obtain the degree.

Bridge Courses

Students without prior formal knowledge and experience in probability and statistics, computer programming, and accounting are required to complete courses BR 1, BR 2 and BR 3 as early as possible.

BR 1 Probability and Statistics
This bridge requirement may be satisfied by an undergraduate level course in statistics and probability given by any accredited institution of higher learning. Courses at Fairfield University recommended for this bridge are MA 17 or MA 217. (See undergraduate catalog or SOE website for a description.)

BR 2 Computer Programming
This bridge requirement may be satisfied by an undergraduate level course in a programming language given by any accredited institution of higher learning. Courses at Fairfield University recommended for this bridge are SW 131 or CS 141. (See undergraduate catalog or SOE website for a description.)

BR 3 Financial Accounting
This bridge requirement may be satisfied by an undergraduate-level course in financial accounting given by an accredited institution of higher learning. Courses at Fairfield University recommended for this bridge are AC 11 or AC 400. (See the Dolan School of Business catalog for a description.)

Required Courses

AC 500 Accounting for Decision Making
This course emphasizes the use of accounting information by managers for decision-making. It is designed to provide managers with the skills necessary to interpret analytical information supplied by the financial and managerial accounting systems. The financial accounting focus is on understanding the role of profitability, liquidity, solvency and capital structure in the management of the company. The managerial accounting focus is on the evaluation of organizational performance of cost, profit, and investment centers. (Prerequisite: AC 400 or an equivalent course in financial accounting) Three credits.

CP 551 Capstone I - Project Definition and Planning
In this first semester of the capstone course, students form project groups, conceive technical approaches to problem solutions, and develop detailed plans and a schedule for project activities. Students execute the planning process using appropriate professional software such as Microsoft Project. The course includes software refresher lectures early in the semester. Students in each team produce a detailed project plan defining the work to be done (task descriptions), the task/subtask organizational structure, task responsibilities (assigning who does what), the task execution schedule (using PERT and Gantt charts as managing tools), areas of risk and risk abatement concepts, and provide an explanation of the value of the work to be performed to fulfill the objectives. Three credits.

CP 552 Capstone II - Project Execution and Results
The second semester of the capstone course concerns implementation of the project plan developed in the prior semester. This typically includes hardware fabrication, software development supporting analytical work, detailed design, experimental studies, system integration, and validation testing, all of which serve as proof of meeting project objectives in data and functional demonstrations. Project teams submit a final report for grading and make a formal presentation to faculty, mentors, and interested personnel from associated industries. Three credits.

DM 460 Project Management
This course concentrates on the general methodology of managing a technology project from concept to operational use with emphasis on the functions, roles, and responsibilities of the project manager. Study of the basic principles and techniques related to controlling resources (i.e. people, materials, equipment, contractors, and cash flow) to complete a technology project on time and within budget while meeting the stated technical requirements. Through group and individual activities, including case study review, students will learn to apply project management tools and techniques. Three credits.

GK 415 Information Systems
This course offers insights into the capabilities of modern software and computing systems, allowing prospective technology managers to discriminate between effective and ineffective applications of software and network systems - considerations essential to managing businesses that depend upon efficient data and information processing. The course covers inputs, outputs, storage, transmission media and information processing, and networking. The course presents current Information Technology (IT) topics designed to enable one with knowledge vital to a successful career as a manager. The student is provided with a knowledge of: hardware and software fundamentals, system categories, overviews of programming languages, networks and communications concepts, e-commerce concepts,

cloud and distributed computing, middleware, database technology, ERP with an overview of the SAP product, system planning, systems development methodologies, traditional and object oriented analysis and design techniques, software package evaluation & selection techniques, IT management issues and practices. In class case studies are discussed and lectures may at times delve into deeper technical matters. This course provides the student with both conceptual and managerial knowledge as well as practical hands on knowledge, useful in joint project team settings and designed to allow one to better lead and participate in company projects. Three credits.

MG 508 Strategic Management of Technology and Innovation: The Entrepreneurial Firm
This course begins by presenting cutting-edge concepts and applications so that students understand the dynamics of innovation, the construction of a well-crafted innovation strategy, and the development of well-designed processes for implementing the innovation strategy. It then focuses on the building of an entrepreneurial organization as a critical core competency in the innovation process. Concurrent with this, it focuses on the development and support of the internal entrepreneur or Intrapreneur as part of the process of developing organizational core competencies that build competitive comparative advantages that, in turn, allow the firm to strategically and tactically compete in the global marketplace. Topics explored include technology brokering, lead users, disruptive technologies and the use of chaos and complexity theory in the strategic planning process. Three credits.

MG 584 Global Competitive Strategy
This course considers the formulation of effective policy and accompanying strategy actions, and the management of such policies and actions. It examines the role of the general manager in this process and presents the diversified issues and problems the management of a business firm may be required to consider and solve in strategic planning. This course also examines the problems and tasks of strategy implementation and the general manager's function of achieving expected objectives and establishing new ones to assure the continuity of the business organization. Students are required to prepare a business plan as part of this course. Three credits.

RD 460 Leadership in Technical Enterprise
This course introduces major leadership theories and explores the issues and challenges associated with leadership of technical organizations. The course integrates readings, experiential exercises, and contemporary leadership research theory. Participants investigate factors that influence effective organizational leadership as well as methods of enhancing their own leadership development. The course prepares executives, supervisors, and managers to master the complex interpersonal, social, political, and ethical dynamics required for leading modern organizations. Three credits.

RD 500 An Introduction to Systems Engineering
This course instructs in the formation and development of new ideas and their subsequent use in the creation of products and services. This involves the integration of knowledge in design, development, software and economics that need be applied, often iteratively, to create new conceptions. This work simultaneously addresses performance and cost. Graphic methods for planning projects are instructed. In addition specialized analytical processes are presented that permit an evaluation and critique of new concepts. These processes and techniques are applied in group activities. In addition, the course requires essential research into specific issues. This research is to be undertaken as part of homework assignments on recommended subjects in which the students will learn the methods that serve to enhance their knowledge and communicate this to enrich the lecture sessions in each class. In summary, the means for developing new ideas and methods to apply them are presented in this course. These newly learned resources will be applied in group actions to gain experience in their use and thus create useful tools for future circumstances that require their application. Three credits.

RD 525 Principles of Quality Management
This course is designed to provide a comprehensive coverage of quality management including planning, assurance and control. Provide an introduction to the fundamental concepts of statistical process control, total quality management, six sigma and the application of these concepts, philosophies, and strategies to issues arising in government and industry. Emphasis will be placed on both theory and implementation methods. Students will gain an understanding of the application of the numerical tools used by teams in the quality management problem-solving process. Statistical methods and case studies are employed. The course is designed to assist students in developing processes by which they will be able to implement these methods in their working environment. Three credits.

The following section presents descriptions of courses that may be used to fulfill core requirements or serve as electives.

DM 405 Supply Chain Design
This course deals with the optimization of processes in a supply chain using analytical techniques and modeling. The term “supply chain” refers to all the resources required in moving material through a network of manufacturing processes, quality assurance measures, maintenance, and customer interfaces to produce, deliver, and maintain a product. These are modeled using simulation of this chain, permitting an analyst to design the supply chain and to predict its performance. Students are taught to create discrete simulation models that will reflect the actual performance of a supply chain, prior to committing investments in inventory, procurement and fabrication. These simulations offer three general benefits: a) may be used to achieve an optimized design; b) may be used in solving production expansion needs; and c) can be used to locate and correct problems in an existing manufacturing system. Three credits.

DM 407 Design of Manufacturing Systems and Processes
In this course, students will learn the significance and ramifications of “Lean Manufacturing” practices and advantages they provide to a manufacturing company. They will learn how to analyze the cross functional processes and to understand how strategic business objectives are translated into specific actions involving facilities, equipment, new skills, and process improvements that must be achieved. Tactical planning and execution design are introduced using specific analytical techniques including: (1) statistical segmentation of demand, (2) production and inventory considerations of facility and product design, including the impacts of variability, (3) use of statistical segmentation for make-to-stock, make-to-order, and make-to-plan strategies, (4) introduction to replenishment techniques including: level loading, rhythm cycles and considerations for safety and cycle stock, and (5) use of postponement strategies in optimizing inventory control. Three credits.

DM 420 Design for Economy and Reliability
Considerations of reliability permit a product to achieve a desired performance throughout its service life, thereby satisfying those who have purchased it. Careful thought and design produce reliability and economy of manufacture. This course instructs the prospective technology manager in the considerations leading to creation of cost-effective products of quality and presents: (1) the Total Design method, (2) concurrent engineering and the effective use of design reviews, (3) quality function deployment, (4) cost structures and models, (5) materials selection and economics, (6) robust design validation techniques and the Taguchi method, and (7) the Fault Tree and its use as a diagnostic aid in design validation. Three credits.

DM 430 Management of Design for Automation
This course addresses the need for inherent flexibility in modern manufacturing systems that must accommodate changing product lines through the application of robotics and other forms of programmable automation, and the need to provide rapid, accurate communications between business managers, design engineers, and product managers. Effective product design requires a basic understanding of the manufacturing system being used in production including: mechanical design of all material manipulators and material handling equipment, design compatibility between all parts and the automation equipment considered for use. Coursework dealing with these issues includes: 1) the organization and scheduling of manufacturing processes, 2) the principles of programmable automation, 3) the theory and application of Boothroyd's design for assembly methodology, 4) process cost estimation techniques, 5) methods for judging the soundness of investments in manufacturing equipment that a specific design may require, 6) market implications and the effect of design features on sales revenue and product market life, and 7) social impacts. Three credits.

MG 500 Managing People for Competitive Advantage
This course focuses on effectively managing people in organizations by emphasizing the critical links between strategy, leadership, organizational change, and human resource management. The course assists students from every concentration including finance, marketing, information systems, and accounting to become leaders who can motivate and mobilize their people to focus on strategic goals. Topics include the strategic importance of people leading organizational change, corporate social responsibility, implementing successful mergers and acquisitions, and fundamentals of human resource practices. Discussions interweave management theory and real world practice. Class sessions are a combination of case discussions, experiential exercises, and lectures. Three credits.

MG 503 Legal and Ethical Environments of Business
This course helps students become more responsible and effective managers when involved in the gray areas that call for insightful judgment and action. Students develop skills in logical reasoning, argument and incorporation of legal, social, and ethical considerations into decision-making. The course teaches the importance of legal and ethical business issues and enables students to make a difference in their organizations by engaging in reasoned consideration of the normative actions of the firm. Using the case study method, the course provides an overview of current topics, including the legal process, corporate governance, employee rights and responsibilities, intellectual property and technology, and the social responsibility of business to its various stakeholders. Three credits.

MK 400 Marketing Management
This course examines analytical and managerial techniques that apply to marketing functions with an emphasis on the development of a conceptual framework necessary to plan, organize, direct, and control the product and strategies needed for promotion, distribution and pricing of a firm's products. The course also considers the relationship of marketing to other units within a firm. Three credits.

OM 400 Integrated Business Processes
Process management is concerned with the design and control of processes that transform inputs (such as labor and capital) into finished goods and services. Course topics include process mapping, quality management and control, capacity planning, supply chain management, and operations strategies. The course uses case studies to show how concepts and models presented in lectures and readings apply to real-world business situations. Three credits.

RD 450 Management of Risk in Research and Development
This course addresses the formation and development of new ideas and their subsequent use in the creation of products and services. This involves the creation of systems developed from the integration of knowledge in design, development, software and economics and the application of Earned Value and Accountancy. The knowledge so gained is to be applied, often iteratively, to create new conceptions of products and service. This work simultaneously addresses performance and cost. Graphic methods for planning projects are instructed. In addition specialized analytical processes are presented that permit an evaluation and critique of new concepts. These processes and techniques are applied in group activities. In addition, the course requires essential research into specific issues. This research is to be undertaken as part of homework assignments on recommended subjects in which the students will learn the methods that serve to enhance their knowledge and communicate this to enrich the lecture sessions in each class. In summary, the means for developing new ideas and methods to apply them are presented in this course. These newly learned resources will be applied in group actions to gain experience in their use and thus create useful tools for future circumstances that require their application. Three credits.

RD 485 Management of Intellectual Property
Intellectual property may exist in many forms and often goes unrecognized as a part of the wealth of corporations when it can actually represent the most valuable property a corporation holds. This course instructs students in how to recognize the different types of intellectual property and the different forms of protection that may be used to protect its loss to competitive agencies. In addition to enlightenment as to what form it may take, the students are instructed in how to determine its monetary value and how to use it to advance important company objectives such as increasing sales volume and how to establish policies and methods to protect it from theft by competitive firms. Throughout the course, students learn how to address the legal issues surrounding the rights of ownership and the existence of infringements. They recognize the specific issues that distinguish an invention (or any other form of intellectual property) from its competition, causing it to obtain an edge in the market place. Three credits.

MSSE Course Descriptions

SW 400 Software Engineering Methods
This course explores the requirements gathering, system analysis, software design methods and prototyping of software application following the software processes required for the production of high quality software. Techniques for creating documentation and using software development tools will be presented. Students will gain experience in software project management; requirements, analysis, and design; procedural maturity; social, ethical, cultural, and safety issues in software development; interpersonal skills for management and team membership; and the software engineering discernment of systems architecture. Three credits.

SW 401 Software Design Methods
This course is designed to introduce fundamental concepts of object orientation techniques. Through the use of case studies and project work that has the student gradually building a large design specification, students will achieve an understanding of how complex applications are designed and built. (Prerequisite: SW 400 AND SW 403 or SW 408 or permission of instructor.) Three credits.

SW 402 Database Concepts
This course focuses on the steps required to build and maintain the database infrastructure for client/server applications. It covers physical design and implementa tion of the database; the use of the database to meet the informational needs of a client/server system; and the installation, operation and maintenance of the RDBMS software. Specific topics include structured query language, utilities provided by the vendor, the use of an RDBMS, backup and recovery of data, and security and controls. Students perform a number of hands-on exercises using an RDBMS running on Windows 2000. Microsoft SQL Server or Oracle is the software vehicle for lectures and lab exercises. Three credits.

SW 403 Visual C# for Programmers I
This course provides an introduction to programming using Visual C# and the .Net framework. Students learn to create applications using object oriented programming and learn about Microsoft.Net, Visual Studio.Net, classes and objects, v, exception handling, and debugging. Students complete this course understanding how Visual C# interacts with the .Net framework and will be able to build applications using Visual C#. The course is intended for designers and programmers who are developing systems in the Windows environment. Lab included. Three credits.

SW 404 Network Concepts
This course covers the structure and technologies of computer networks architecture including cabling, wiring hubs, file servers, bridges, routers, and network interface cards. It discusses network software and hardware configurations and demonstrates network concepts such as configuring protocol stacks and connecting a personal computer to a network. The course examines the OSI-model, TCP/IP protocol and routing protocols. Student will be able to do subnet of TCP/IP networks. Three credits.

SW 406 Web Client Side Development I
This course introduces the student to developing browser applications for use on the World Wide Web. Students learn client side concepts including the display of static information. The course topics include designing and authoring web pages, usability, search engine optimization, markup languages, style sheet, the client side document object model, and making web pages dynamic on the client side. Three credits.

SW 408 Java for Programmers I
This programming course introduces Java fundamentals. Topics include the Java elements: objects, classes, data types, operators, control structures, and container data structures. The course views object-oriented programming as integral, teaching it throughout. Accordingly, it includes the concepts of encapsulation, inheritance, polymorphism, packages, interfaces, and inner classes. The course teaches screen design using graphical user interfaces and includes data handling concepts such as input from the keyboard, output to the screen, input from files and output to files. The course also introduces the concept of multi-threading in preparation for follow-up studies. Lab included. Three credits.

SW 409 Java for Programmers II
This course covers advanced topic of Java programming. Topic covers multithreading, networking, nested references, design patterns, JDBC, persistence, I/O and advanced GUI such as swing. Data structure concepts such as linked list, tree and basic searching and sorting algorithms will be covered. Lab included. (Prerequisite: SW 408 or permission of the instructor) Three credits.

SW 410 Enterprise Java
Advanced server-side Java technologies. Coverage includes state-of-the-art explorations into server-side technologies such as JDBC, Google Web Toolkit, Enterprise JavaBeans (EJB), Android, XML, etc., as time permits. Lab included. Prerequisite: SW 409 or permission of the instructor. Three credits.

SW 420 Software Testing and Maintenance
This course will cover in-depth methods for software testing, reliability and maintenance of software. Students will learn the principles of software testing and how to apply software testing techniques to the development of quality software and how to deploy software systems, maintain, enhance and reuse software systems. (Prerequisite: SW 401) Three credits.

SW 421 Software Project Management
This course explores software project activities from conception to completion based on best practices. Topics include software systems engineering, personal/team software process management and control, and project planning and management. Through group and individual activities, students apply project management tools and techniques, and address typical problems that occur during the life cycle of the software project. (Prerequisite: SW 403 or SW 408 or permission of the instructor) Three credits.

SW 427 Operating Systems and Programming
This course introduces the internal operation of modern operating systems and students learn how to program on non-Window OS platform. The topics cover a brief history of operating system, the major components of modern operating systems, and the object-oriented methodology on UNIX-like platform. Various UNIX tools will be used in the course and participants study examples using object-oriented programs as well as large system integration by object-oriented methodology. (Prerequisite: SW 403 or SW 408) Three credits.

SW 448 Server Management
Server Management is a course designed to provide the student with the tools necessary to manage Window Server. The topics include user management, installation and configuration of web server, mail server, FTP server, LDAP and backup and other routine system and network administration. Three credits.

SW 482 Special Topics
This course provides an in-depth study of selected topics in software engineering of particular interest to the students and instructor. The course is counted as a major elective/specialization course. The topics and prerequisites will be announced when this course is offered. One to three credits.

SW 483 Independent Study
This course is an individualized study under the supervision of the faculty member. The course emphasizes individual creativity. Students work with a faculty mentor in studying and investigating topics of current interest in software engineering. Students may earn from one to three credits for an independent study course. (Prerequisite: permission of the instructor) One to three credits.

SW 499 Algorithms
This course explores the development and evaluation of algorithms. This class covers classic algorithms, algorithm analysis, searching and sorting algorithms, dynamic programming, heuristics, and graphic algorithms. Algorithm efficiency and performance is a focus as the student gains experiences through problems and programming projects. (Prerequisite: SW 403 or SW 408.) Three credits.

SW 505 Advanced Database Concepts
This course covers topics in database implementation designed to provide software engineers with a wide variety of server-side problem solving techniques. Topics include cursors, query and index optimization, advanced SQL programming, distributed databases, object-oriented databases, clustering, partitioning, and working with XML and other unstructured data. While Microsoft SQL Server is primarily used for demonstration, the topics covered are applicable to any database platform, and the different approaches of the major database vendors are frequently contrasted. Format consists of lecture and lab. (Prerequisites: SW 402 plus SW 409 or SW 506, or instructor approval.) Three credits.

SW 506 Visual C# for Programmers II
This course teaches application developers the more advanced elements of programming with Visual C# for the .NET framework. Students learn object oriented programming using classes, objects and inheritance, and cover topics such as multithreading, design patterns, and advanced GUI. Data structure concepts such as linked list, tree and basic searching and sorting algorithms will be covered. At the completion of

this course, students will be able to produce complete Windows and console based applications with Visual C#. Lab included. (Prerequisite: SW 403.) Three credits.

SW 508 Data Warehouse Systems
This course examines the tools, techniques and processes used in the design and development of data warehouses. As such we will examine how to successfully gather structure, analyze, and understand the data to be stored in the data warehouse, discuss techniques for modeling the data in the data warehouse, discuss the ETL process and describe techniques for presenting and analyzing the data in the warehouse. We will also discuss capacity planning and performance monitoring. Microsoft Analysis Services and Sybase ASIQ will be examined as approaches for implementing a data warehouse. (Prerequisite: SW 402) Three credits.

SW 512 Web Development II with ASP.NET
This course teaches site developers how to create robust, scalable, data-driven ASP.NET Web. Students learn how to create ASP.NET applications using a text editor and the command-line tools, as well as using Visual Studio. Topics include the .NET framework, web forms, validation controls, database connectivity, web services, component development, user controls, custom server controls, and best practices, etc. At the end of the course, students are able to describe the issues involved in creating an enterprise web site, creating and publishing a web site, creating interactive content for a Web site, adding server scripting to a Web page using ASP.NET, implementing security in a Web site, and reading and writing information to a database from ASP.NET. (Pre- or co-requisites: SW 406 and SW 403 or permission of instructor.) Three credits.

SW 516 High Performance Database Web Applications
This course is an introduction to the PHP programming language. Topics include installation and configuration with the Apache http server, variables and data types, language syntax, control structures, functions, strategies and tools for handling input and generating output, error handling, sending email, manipulating dates and times, string manipulation and regular expressions, SQL and MySQL database access. The course also covers advanced topics such as MVC model-based web application development using framework and packages from the PHP Extension and Application Repository (PEAR). At the conclusion of the course, students are able to design and implement scalable data-driven web applications. (Prerequisites: SW 406, or by permission of the instructor). Three credits.

SW 518 Data Mining and Business Intelligence
This course examines business intelligence concepts, methods and processes used to improve data-centric business decision support solutions with a particular focus on data mining techniques. We will first examine the principles and practices of gathering and retrieving large volumes of data for analysis and synthesis. Next we will examine analytical techniques for extracting information from large data sets. In particular the following data mining techniques: classification, estimation, prediction, and clustering will be examined. During the course we will also discuss knowledge management, how organizations manage and use the knowledge that they acquire, and presentation of data. Three credits.

SW 530 Introduction to Information Security
This course gives students a fundamental understanding of current Social Engineering methods in the Information Security arena. Deception and human behavior is exploited to gain valuable information, which is very relevant to today's growing security concerns. This course is another key class in the Information Security track in the MSSE program and builds upon the weaknesses in the human factor. Areas of discussion will be methods, current trends, and most of all countermeasures. Instruction includes lectures and discussion assignments which involve analyzing current work places and social gatherings coupled with scenarios of exploitation. Three credits.

SW 531 Applications and Data Security
This course is structured around applications and data security in current enterprises. Systems Development Life Cycle (SDLC) components coupled with Database security are emphasized. Common countermeasures and best business practices that help ensure a solid security understanding are the objective of the course. Three credits.

SW 535 Web Application Security
This course is structured around Internet transactions and data associated with these transactions. It encompasses encryption schemes of transmission to execution of code and complete flight of an execution. Web based technologies are the main focus, along with general understanding of underlying web infrastructure and discussing common exploits. Common countermeasure and best business practices that help ensure a solid security understanding are the objective of the course. Three credits.

SW 550 / SW 551 Capstone Professional Project I and II
In these two semester capstone courses, students form teams, perform a technical study, and design software systems based on either their customer's requirements, develop, test, and deploy software systems. The results of these projects provide a library of case studies, designs, and software development techniques, and project management skills that are of general interest to local information technology professionals. A capstone prospectus, approved by your advisor, must be submitted to and accepted by the director of the program prior to starting the capstone sequence. (Prerequisites: SW 401 and completion of 18 credits MSSE courses at the minimum.) Six credits for the two-course sequence.

SW 560 / SW 561 Software Engineering Thesis I and II
In these two semester thesis courses, a student will work on individual research project that a student should formulate as a problem, solve it under the guidance of a faculty member and communicate the results. Work involves literature search, writing a proposal, analysis and/or implementation with critical thinking, and writing convincingly. The student must also submit a final paper for possible publication in a refereed journal appropriate to the topic. (Prerequisites: SW 401 and completion of 18 credits of MSSE courses at the minimum) Six credits for the two-course sequence.

SW 596 Network Routing and Switching
The course presents concepts and develops skills needed in designing, implementing, and troubleshooting local and wide-area networks. Students design and configure LAN, WAN using routers/switches and learn component of wireless networks and how to configure it and troubleshoot the network and optimize its performance. It also provides numerous lab opportunities to configure and troubleshoot networks with Cisco routers and switches (Prerequisite: SW 404) Elective. Three credits.

SW 599 Information Security Measures and Countermeasures
This course covers current information security practices and countermeasures put in place to safeguard against security breaches. The course reviews Internet infrastructures such as firewalls, IDS systems, and honey pots. Additional areas include risk analysis, computer-use policies, physical security, Internet/intranet security, Malware, firewall infrastructure, and current information security issues. (Prerequisite: SW 404) Elective. Three credits.

MSECE Course Descriptions

Bridge Courses

Required to complete one's preparation for the master's program is strong aptitude in the area of electric circuits, fields and waves, electronic circuits and devices. Students with deficiencies in those areas should confer with the Program Director to create a course of study. (See undergraduate catalog or visit the SOE website for a description.)

ECE 405 Electronic Materials
This course describes the properties and applications of certain materials used in the design and manufacture of electronic assemblies. Ceramics are often used as insulators, heat sinks, and substrates for interconnection structures. The course presents electrical, mechanical, and thermal properties of various ceramics, along with methods of fabricating and machining ceramic structures. Adhesives used to mount components and to replace mechanical fasteners such as screws and rivets provide connections that are stronger and take up less space. The course examines properties of adhesives such as epoxies, silicones, and cyanoacrylates under conditions of high temperature storage and humidity, along with methods of applications. Solders used to interconnect electronic components and assemblies are selected for temperature compatibility, mechanical properties, and reliability. The course emphasizes the new lead-free solder materials and presents the properties of plastic materials and the methods of forming plastic structures. (Prerequisite: EE degree or equivalent) Three credits.

ECE 406 Advanced Digital Design
This course covers modern methods of digital logic design via VHDL (VHSIC Hardware Description Language) and modern design methodology. Programmable Device Architectures are discussed. Targeting both FPGA and CPLD devices, structural, behavioral, and data-flow VHDL models are developed for familiar logic and arithmetic circuits, and state machines. The difference in coding for synthesis and coding for simulation is stressed. Further development of VHDL Language skills is performed in the context of an introduction to Computer Architecture. Memory and Bus models are discussed. Design projects apply the theory to practical problems. (Prerequisite: CR 245 or permission of the instructor) Three credits.

ECE 407 Fiber Optic Transmission and Communication
This course examines the theory and basic elements of fiber optic communications systems; fundamentals of transmission in optical fibers; source component operations including light emitting diodes and solid-state lasers; and coupling element and detector devices. Students analyze modulation and demodulation techniques and determine overall loop performance relative to bandwidth and signal-to-noise ratio. Design problems enhance student understanding. (Prerequisites: EE 231, EE 301) Three credits.

ECE 407L Fiber Optic Transmission and Communication Laboratory
Students are introduced to fiber optics with experiments on Snell's Law and total internal reflection. Students then use optical test equipment to measure the characteristics and applications of fiber optic cables, including simple communication systems. Fiber optic characteristics may include losses due to transmission, mismatch, and bending, optical fiber connections and splicing, and frequency response. Both in-lab computer assisted instruction and a textbook will be used to supplement the experiments. Students prepare laboratory reports each week on their results. (Co-requisite: ECE 407) One credit.

ECE 410 Voice and Signal Processing
This course supports the signal processing and computer systems domain. It provides an overview of digital audio and its application, and discusses the current state of streaming audio on the Internet and digital audio processing fundamentals. Students apply these theories by creating programs that synthesize and process music and voice. The course exposes students to

the elements of multimedia network delivery of audio content. (Prerequisite: SW 408 or permission of the instructor) Three credits.

ECE 415 Engineering Applications of Numerical Methods
This course provides students with the theoretical basis to proceed in future studies. Topics include root-finding, interpolation, linear algebraic systems, numerical integration, numerical solution of ordinary and partial differential equations, modeling, simulation, initial boundary value problems, and two point boundary value problems. (Prerequisite: SW 408 or equivalent demonstrated programming language skills) Three credits.

ECE 420 Readings in Electrical and Computer Engineering
Students formulate a project proposal, perform literature surveys, and learn the finer points of technical writing and presentation at the graduate level. The course requires a meta-paper written about the literature in the field. It emphasizes the basics of technical writing and research, and is organized to emphasize methods of the writing and the research process. Students learn to state a problem, the techniques of analysis, methods of investigation, and functional organization. (Prerequisite: completion of one domain) Three credits.

ECE 425 Thermal Management of Microdevices
This course considers the generation and removal of heat in electronic assemblies. The course describes the sources of heat in an electronic assembly, such as the contribution of the switching speed and the “ON” resistance of field effect transistors at the device level, covers the effects of heat on system reliability analytically, and describes the resulting failure mechanisms in detail. It presents methods of removing heat from electronic circuits, including heat pipes, Peltier effect devices (thermoelectric coolers), and convection, using both gases and fluids to transfer heat, and describes methods of measuring heat, including contact and noncontact methods. (Prerequisite: EE degree or equivalent) Three credits.

ECE 430 Image Processing
This first course in image processing with biomedical applications covers image algebra, arithmetic operations, Boolean operations, matrix operations, achromatic and colored light, selecting intensities, Gamma correction, chromatic color, psychophysics, color models, color space conversion, low-level pattern recognition, as well as video processing, compression and two-dimensional streaming, and multi-resolution multimedia network streaming. This course requires substantial programming effort and emphasis is placed on good software engineering practices. Students write image-processing applications. (Prerequisite: ECE 410 or CR 310 or SW 511 or permission of the instructor) Three credits.

ECE 431 Biomedical Signal Processing
This course presents an overview of different methods used in biomedical signal processing. Signals with bioelectric origin are given special attention and their properties and clinical significance are reviewed. In many cases, the methods used for processing and analyzing biomedical signals are derived from a modeling perspective based on statistical signal descriptions. The purpose of the signal processing methods ranges from reduction of noise and artifacts to extraction of clinically significant features. The course gives each participant the opportunity to study the performance of a method on real, biomedical signals. (Prerequisites: SW 131 or CS 141 or SW 408 and MA 146 or MA 122 or permission of the instructor) Three credits.

ECE 432 Biomedical Imaging
The course presents the fundamentals and applications of common medical imaging techniques, for example: x-ray imaging and computed tomography, nuclear medicine, magnetic resonance imaging, ultrasound, and optical imaging. In addition, as a basis for biomedical imaging, introductory material on general image formation concepts and characteristics are presented, including human visual perception and psychophysics. (Prerequisite: ECE 431) Three credits.

ECE 433 Biomedical Visualization
An introduction to 3D biomedical visualization. Various technologies are introduced, include UltraSound, MRI, CAT scans, PET scans, etc. Students will learn about spatial data structures, computational geometry and solid modeling with applications in 3D molecular and anatomical modeling. (Prerequisite: SW 232 or equivalent) Three credits.

ECE 435 Microelectronics
This course considers the methods of interconnecting electronic components at very high circuit densities and describes methods of designing and fabricating multilayer printed circuit boards, co-fired multilayer ceramic substrates, and multilayer thin film substrates in detail. It discusses the methods of depositing thick and thin film materials, along with their properties, and analyzes these structures and compares them for thermal management, high frequency capability, characteristic impedance, cross-coupling of signals, and cost. The course also includes techniques for mounting components to these boards, including wire bonding, flip chip, and tape automated bonding. (Prerequisite: EE degree or equivalent.) Three credits.

ECE 440 Computer Graphics
This course supports the visualization and computer systems domain with computer gaming applications. It is an introduction to GUI and game design and computer graphics concepts. Topics include human-computer interfaces using the AWT; applied geometry; homogeneous coordinate transforms. (Prerequisite: SW 408 or permission of the instructor.) Three credits.

ECE 441 Computer Systems Architecture
An investigation into computer architectures (past, present and future). We will explore various hardware and software techniques designed to maximize parallelism and improve performance. Front-end design (branch prediction, instruction fetch, trace caches), HW/SW techniques of parallelism, Memory system design (caching, prefetching), Technology issues (low power, scaling, reliability, nanotechnology), multiprocessors. Class will include a mix of lectures and discussions on assigned readings of recent publications. Students will be responsible for leading and participating in these discussions. A course project exploring a particular topic in depth will be required. (Prerequisite SW 408, CR 245 or permission of instructor) Three credits.

ECE 445 Digital Integrated Circuit Design
This course considers the design and layout of digital integrated circuits. It presents the fabrication, structure, and properties of CMOS devices in detail along with the structure of basic building blocks, such as flip-flops and counters, and covers digital circuit design techniques and simulation. Students learn how to lay out digital circuits to incorporate the design requirements. The course also discusses custom integrated circuit specification and design techniques, along with economics. (Prerequisite: CR 245 or equivalent.) Three credits.

ECE 447 Analog Integrated Circuit Design
This course considers the design of CMOS analog integrated circuits. The fabrication, structure, and properties of analog CMOS devices are presented in detail along with the structure of basic building blocks, such as current mirrors and operational amplifiers. Students design and simulate circuits using Spice and lay out analog CMOS circuits using software designed for this purpose. (Prerequisite: EE 331 or equivalent.) Three credits.

ECE 448 Embedded Microcontrollers
Introduction to embedded microcontrollers in electronic and electromechanical systems. Hardware and software design techniques are explored for user and system interfaces, data acquisition and control. These tools are used to develop software code for practical applications such as motor speed control and voltage regulation for power supplies. (Prerequisite: CR 245 or equivalent.) Three credits.

ECE 448L Embedded Microcontroller Laboratory
This laboratory covers the basic operation and applications of a microprocessor. Students learn to program a microprocessor to control applications such as motor speed by the use of an emulator connected to a PC. They design a circuit using a microprocessor for a specific application and write a program to control the circuit. On completion of the program, they use the emulator to program an actual microprocessor for use in their circuit. (Co-requisite: ECE 448.) One credit.

ECE 450 Computer Animation
This overview of computer animation techniques includes traditional principles of animation, physical simulation, procedural methods, and motion-capture-based animation. The course discusses computer science aspects of animation, with lessons ranging from kinematic and dynamic modeling techniques to an exploration of current research topics - motion re-targeting, learning movements and behaviors, and video-based modeling and animation. Class projects offer hands-on animation experience. (Prerequisite: ECE 440 or CR 325.) Three credits.

ECE 451 Nanoelectronics I
Building on the two introductory courses in nanotechnology, this course is the first of two that describe how nanotechnology can be integrated into the electronics industry. The unique electrical, mechanical, and optical properties of structures in the nanometer range and how they may be applied to electronics products are discussed. Principles of electronic materials, semiconductor devices, and microfabrication techniques will be extended to the nanoscale. Students will increase their knowledge of electronic structure, quantum mechanics, and the behavior of optoelectronic and low-dimensional systems. Students make extensive use of the available literature to seek out potential applications of nanotechnology. Intended for students interested in the minor in nanotechnology - Nanoelectronics track. Also open to interested graduate students in ECE. Lecture course. (Prerequisite: EG 212 or permission of the instructor). Three credits.

ECE 452 Nanoelectronics II
This second course in Nanoelectronics emphasizes present and potential applications of nanotechnology in the various fields of next-generation electronics. The course will discuss topics relevant to electromagnetism at the nanoscale, MEMS/NEMS, nanosensors, nano-optics, molecular electronics, and nanoelectronic interfaces with biology. Student teams will survey the available literature and companies involved in designing and manufacturing devices with Nanoelectronics as a core to select a product for analysis in terms of technical and economic advantages, and present their findings. Teams of students also conceptualize a potential product, and perform the same analysis. Intended for students interested in the minor in nanotechnology - Nanoelectronics track. Also open to interested graduate students in ECE. (Prerequisite: ECE 315 /ECE 451). Three credits.

ECE 455 Sensor Design and Application
This course covers the design, fabrication, and properties of sensors intended to measure a variety of parameters, such as stress, temperature, differential pressure, and acceleration. Sensors of different types are used in a wide range of equipment, especially automated equipment, to detect changes in state and to provide the signals necessary to control various functions. Sensors are generally connected to electronics systems that process and distribute the signals. The support electronics must identify the signal, separate it from noise and other interference, and direct it to the appropriate point. These support electronics are a critical part of the sensor technology; students discuss their design and packaging in detail. (Prerequisite: EE degree or equivalent.) Three credits.

ECE 457 Advanced Linear Systems
This course considers the use of Laplace transforms to solve linear systems with multiple time constants and the solution of multiple linear simultaneous equations. The analysis of linear systems usually results in the generation of transfer functions in s, the Laplace transform variable. Particular attention is given to the electrical and mechanical implementation of these transfer functions in linear systems using both analysis and synthesis techniques. (Prerequisite: EE 301 or equivalent.) Three credits.

ECE 460 Network Programming
This course covers principles of networking and network programming. Topics include OSI layers, elementary queuing theory, protocol analysis, multithreading, command-line interpreters, and monitors. Students write a distributed computing system and check their performance predictions with experiments. (Prerequisite: SW 232 or equivalent) Three credits.

ECE 461 Special Topics
This course covers special topics and is offered on demand. Students can take this course multiple times, for credit. Topics in electrical and computer engineering will be pre-announced, along with a syllabi. Three credits.

ECE 465 Nonlinear Control Systems
Control systems are used in many industrial applications to control processes or operations and in many non-industrial applications as well. Nonlinear control systems are frequently used in applications where the control variables have a wide dynamic range. Unlike linear systems, the analysis of nonlinear systems rarely results in a closed-form mathematical expression. This course considers the analysis and applications of nonlinear control systems by numerical and graphical techniques and considers means of implementing the solutions. (Prerequisites: ECE 415 and EE 302 or equivalent.) Three credits.

ECE 470 Network Embedded Systems
This course covers distributed development - connecting peripherals to networks via Java. Plug-and-play paradigm is used to add services on the fly. Students learn about the following topics: multicast and unicast protocols, service leasing, lookup services, remote events, sharing data between distributed processes, and distributed transactions. The course also covers interfacing hardware (sensors, robotics, etc.) to the Web. (Prerequisite: SW 408.) Three credits.

ECE 475 Microwave Structures I
This course considers the analysis and design of structures used in microwave transmission and reception. The course covers distributed parameters in detail, leading to a discussion of the properties of transmission lines. It presents the utilization of distributed parameter structures to design filters, couplers, and mixers, along with methods of implementation. Also included are strip line and microstrip transmission lines and filters. The course discusses microwave devices, both Si and GaAs, including low-power and high-power devices and laser diodes. (Prerequisite: EE 321 or equivalent.) Three credits.

ECE 476 Microwave Structures II
This course is a continuation of ECE 475 and covers the design and analysis of microwave amplifiers, oscillators and mixers, frequency multipliers, and antennas. The course begins by presenting electrical models of RF components and relating those models to design methods. The effects of internal and external noise are considered in the models. Practical applications and design are emphasized. (Prerequisite: ECE 475). Three credits.

ECE 480 Wireless Systems I
The applications of wireless communication are expanding rapidly - from cellular phones to wireless internet to household appliances - and involve many disciplines other than microwave transmission. This course covers several aspects of wireless communication, including antenna design, FCC regulations, and multi-channel transmission protocols. In addition, it discusses modern design approaches such as Bluetooth. Students learn how analog and digital signals are coded. The course also discusses transmission during interference and EMI/RFI as well as fiber optics communication. (Prerequisite: EE 321 or equivalent.) Three credits.

ECE 481 Wireless Systems II
This is a continuation of ECE 480. The topics to be covered include diversity, coding, multiple antennas, and equalization. Modern applications requiring Multicarrier Modulation and Spread Spectrum techniques are also discussed. The course concludes with an examination of 3G and 4G methods and applications. Prerequisite: ECE 480. Three credits.

ECE 483 Independent Study
Students pursue special topics, projects, and/or readings in selected areas. Students must meet with the instructor to discuss the proposed topic of study. (Prerequisite: Permission of the instructor.) Three credits.

ECE 485 Digital Communications
This course is designed to explore current digital communications features, including network communications between computers. It includes discrete time signals and systems, Z-transforms, discrete Fourier transforms, fast Fourier transforms, digital filter design, and random signals. Fundamentals of sampling principles and channel coding are utilized to develop common baseband and digital modulation techniques (ASK, FSK, PSK, PCM, and delta modulation). Transmission over bandwidth constrained channels, and signal detection and extraction. Multiplexing and multiple access networks are also analyzed. The lecture material is illustrated with practical examples. (Prerequisite: EE 301 or equivalent.) Three credits.

ECE 490 Analog Communication Systems
The course focuses on analog communication systems and the effects of noise on those systems, developing modulation and demodulation techniques (amplitude, frequency, and phase modulation and pulse code). It discusses dealing with non-linear system elements and presents a mathematical treatment of the effects of various noise sources on these systems. Historical design studies and topics in communication applications permit students to apply these concepts to meet system requirements. The course clarifies important concepts through simulation of modulation techniques on multimedia computing systems. (Prerequisite: EE 301.) Three credits.

ECE 495 Power Generation and Distribution
This course considers the generation and distribution of electrical power to large areas. Three-phase networks are described in detail, including both generators and loads. Methods of modeling distribution systems by per-unit parameters are covered, along with power factor correction methods. Fault detection and lightning protection methods are also described. Some economic aspects of power generation and distribution are presented. (Prerequisite: EE degree or permission of instructor.) Three credits.

ECE 496 Fault Analysis in Power Systems
This course covers three types of faults in electrical power grids: open lines, lines shorted to ground, and lines shorted to each other. Methods of locating faults are covered, along with an analysis of the effects. Methods of protection and fault isolation are also covered. (Prerequisite: ECE 495.) Three credits.

ECE 505 Advanced Power Electronics
This course considers the design and application of electronic circuits related to power generation and conversion including inverters, power supplies, and motor controls. Topics include AC-DC, DC-DC, DC-AC, AC-AC converters, resonant converters, and the design of magnetic components. Models of electric motors and generators are presented to facilitate the design of controls for these structures. (Prerequisite: EE 331 or equivalent.) Three credits.

ECE 510L Product Design Laboratory
This laboratory course provides hands-on experience in measuring and analyzing the electrical and mechanical properties of materials used in the design of electronic products. It also covers thermal analysis and methods of removing the heat from electronic circuits. Experiential learning includes measurement of temperature coefficient of expansion, measurement of thermal resistance, measurement of tensile strength, measurement of material hardness, temperature measurement of electronic components, Peltier effect (thermoelectric coolers), heat pipes, convection cooling (fins and air flow), and heat flow across a bonding interface such as solder or epoxy. (Prerequisite: ECE 405 or equivalent.) One credit.

ECE 515L Microelectronics Laboratory
This laboratory provides students with an understanding of the processes used to fabricate thick and thin film circuits. As part of their experiential learning, students sputter several materials onto a ceramic substrate and investigate the properties of the sputtered film, such as resistivity and adhesion. Students screen print thick film materials, including conductors, resistors, and insulators onto a ceramic substrate and fire them at an elevated temperature, and investigate the properties of the fired film, plot the distribution of resistor values, and apply statistical methods to determine design curves. Students solder components to the substrates to complete a circuit and analyze the properties of the finished circuit. (Corequisite: ECE 435.) One credit.

ECE 520L System Design Laboratory
This laboratory provides students with an understanding of sensors and non-linear control systems. Experiments include temperature sensors such as thermocouples, thermistors, and infrared, motion sensors, strain gauges, nonlinear servos, and computer analysis of nonlinear systems. (Corequisite: ECE 455 or equivalent.) One credit.

ECE 525L Communications Systems Laboratory
In this laboratory, students acquire hands-on experience with waveguides, transmission lines, and antennas. They learn how to characterize these structures at microwave frequencies and examine how they affect transmission. They set up prototype wireless transmission systems and transmit and receive analog and digital systems. They analyze the data for integrity and accuracy of transmission. Experiential learning includes measurement of characteristic impedance of transmission lines, simple antenna design (students construct simple antennas and determine the effect of the design on directionality and other parameters), and wireless concepts (students build a wireless communications system and send data back and forth, one-way and two-way; this can be a capstone project involving teams to design and analyze various aspects). (Prerequisite: ECE 476 or equivalent.) One credit.

ECE 530L Power Electronics Laboratory
This laboratory provides hands-on experience in analyzing and designing power electronics circuits and in analyzing and modeling power generation and distribution systems. Students design and construct voltage regulators, switching power supplies, and motor controllers. Students also develop circuit models for AC and DC motors and power transformers. Experiential learning includes developing circuit models for power distribution systems, measuring parameters of motors and transformers and using the data to develop electrical circuit models of these devices, and analyzing the properties of power distribution systems and developing computer models for them. (Corequisite: ECE 505 or equivalent.) One credit.

ECE 550, ECE 551 Thesis I, II
The master's thesis tests students' abilities to formulate a problem, solve it, and communicate the results. The thesis is supervised on an individual basis. A thesis involves the ability to gather information, examine it critically, think creatively, organize effectively, and write convincingly; it is a project that permits students to demonstrate skills that are basic to academic and industry work. The student must also submit a paper for possible inclusion in a refereed journal appropriate to the topic. (Prerequisite: ECE 420.) Six credits.

MSME Course Descriptions

MC 400 Feedback and Control Systems
This course emphasizes analysis and synthesis of closed loop control systems using both classical and state-space approaches with an emphasis on electro-mechanical systems. The mathematical requirements include the Laplace transform methods of solving differential equations, matrix algebra and basic complex variables. The discussion of classical control system design includes the modeling of dynamic systems, block diagram representation, time and frequency domain methods, transient and steady state response, stability criteria, controller action [Proportional (P), proportional and integral (PI), Proportional, integral and derivative (PID) and pseudo-derivatives feedback], root locus methods, the methods of Nyquist and Bode and dynamics compensation techniques. The discussion of state-space methods includes formulation and solution (analytical and computer-based) of the state equations and pole-placement design. The course integrates the use of computer-aided analysis and design tools (MATLAB) so as to ensure relevance to the design of real world controlled electro-mechanical systems using case studies and applications to electrical and mechanical systems. Includes lab (hardware based) exercises. Prerequisites: MA 321 and ME 203 (see undergraduate catalog), or equivalent. Three credits.

ME 410 Vibration Analysis
This course covers fundamental laws of mechanics, free and forced vibration of discrete single and multi-degree- of-freedom systems, periodic and harmonic motion, viscous damping, and measures of energy dissipation. Modal analysis for linear systems, computational methods in vibration analysis, natural frequencies and mode shapes, analytical dynamics and Lagrange's equation, longitudinal, torsional, and flexural vibration of continuous elastic systems (strings, rods, beams) are discussed. Students learn energy methods, approximate methods for distributed parameter systems, and dynamic response by direct numerical integration methods. (Prerequisites: ME 203, MC 290, or equivalent.) Three credits.

ME 411 Advanced Kinematics
Topics included in kinematics are spatial mechanisms, classification of mechanisms, basic concepts and definitions, mobility criterion, number synthesis of mechanisms, kinematic analysis of mechanisms: Raven's method, Hartenberg and Denavit's method, Chace's vector method, general transformation matrix method, Dual number quaternion algebra method, method of generated surfaces, method of constant distance equations, and method of train components. Class covers existence criteria and gross-motion analysis of mechanisms, kinematic synthesis of mechanisms, function generation synthesis, rigid-body guidance synthesis, and path generation synthesis, coupler curves and cognates, and Robert's cognates and spatial coupler curves. Three credits.

ME 412 Advanced Dynamics
The topics in the area of Dynamics include degrees of freedom, generalized coordinates, constraints, principle of virtual work and D'Alembert's principle. Energy and momentum, frames of reference, orbital motion, Lagrange's equation, moments and products of inertia, and dynamics of rigid bodies are also discussed, as well as variational principles: stationary value of a function, Hamilton's principle, principle of least action, Hamilton's equation, and phase space. (Prerequisites: ME 203, or equivalent.) Three credits.

ME 425 Engineering Applications of Numerical Methods
See ECE 415.

ME 427 Applications of Fracture Mechanics in Engineering Design
This course covers fracture mechanics concepts for design, materials selection, and failure analysis. The fundamental principles of fracture parameters and criteria, stress field at the tip of a crack, fracture toughness, thickness effect, plastic zone concept, and crack growth under cyclic loading and aggressive environment will be presented. Emphasis will be placed on the practical applications of fracture mechanics by incorporation of design problems and laboratory demonstrations in the course. (Prerequisite: the equivalent of ME 308 or equivalent.) Three credits.

ME 428 Computational Fluid Dynamics
Introduction to computational methods used for the solutions of advanced fluid dynamics problems. Emphasis on concepts in finite difference methods as applied to various ordinary and partial differential model. Equations in fluid mechanics, fundamentals of spatial discretization, numerical integration, and numerical linear algebra. A focus on the engineering and scientific computing environment. Other topics may include waves, advanced numerical methods (like spectral, finite element, finite volume), non-uniform grids, turbulence modeling, and methods complex boundary conditions. (Prerequisite ME 347 or equivalent) Three credits.

ME 444 Mechanics of Composite Material
This course covers structural advantages of composite materials over conventional materials. High strength-to-weight ratios, analysis of fiber-reinforced, laminated and particle materials. 3-D anisotrophic constitutive relations. Classical; lamination theory and boundary conditions for composite beams, plates and shells. Boundary value problems and solutions for static loads, buckling and vibrations. Higher order theories incorporating shearing deformation and layer wise theories. Inter laminar stresses and edge effects. Response of composite structures to static and dynamic loads. Study of thermal and environmental effects and failure criteria.(Prerequisite: MF 207) Three credits.

ME 450 Gas Dynamics
This course reviews fundamental concepts and equations of fluid dynamics. One dimensional compressible flow solutions with and without friction are covered. Equations of conservation of mass, rate of strain tensor, Navier-Stokes equations, mechanical and thermal energy equations with derivations are discussed. Equations are presented in Cartesian and orthogonal curvilinear coordinate systems. Boundary layer theory is covered. Students will discuss laminar and turbulent viscous flow solutions, including boundary layers, Couette, & Poiseuille flows. In addition to analytical closed form solutions, an introduction to computational methods is presented. (Prerequisite: ME 347, or equivalent.) Three credits

ME 451 Energy Conversion
This course covers the major topics in energy conversion, including fuels used in energy conversion; solar energy; gas turbine engines and applications; internal combustion engines; heat pumps; classic and novel power and refrigeration cycles; system analysis; system economics; and environmental considerations. The course includes computer simulation of power plant performance to optimize energy conversion efficiency. A research report on one of the emerging sources of energy is an essential part of this course. (Prerequisite: ME 349) Three credits.

ME 452 Heat and Mass Transfer
This course covers the basic concepts of conduction, convection, and radiation heat transfer. Boiling and condensation; design and performance of selected thermal systems (including heat exchangers); laminar and turbulent flows as related to forced and free convection are all studied. Mathematical modeling of engineering systems using modern analytical and computational solution methods are also covered. (Prerequisite: ME 349 or equivalent.) Three credits.

ME 453 Turbomachinery
Theory and fundamentals of modern turbomachinery for aerospace (helicopter, aircraft) and power generation (marine, industrial) applications. Brayton engine cycle analysis and performance improvement are examined. Applications of the principles of fluid mechanics and thermodynamics to the design of turbines and compressors are discussed; also,component analysis and velocity diagram for axial compressors, centrifugal compressors and axial turbines. Discussion of combustion and environmental emissions is included. (Prerequisite: ME 347 or equivalent) Three credits.

ME 470 Applications of Finite Element Analysis
This course examines applications of finite element analysis in modern engineering including structural analysis, fluid flow, heat transfer, and dynamics. Finite element formulations covering 2, and 3 dimensional elements as well as energy methods are developed. Students develop techniques for application of finite element method in structural design, dynamic system response, fluid and thermal analyses. Application of methodology to fluid flow is presented. Students solve example and design problems manually and using modern finite-element analysis software, ANSYS and FLUENT. (Prerequisites: ME 318 or equivalent.) Three credits.

ME 495 Independent Study
A well-planned program of individual study under the supervision of the faculty member. Three credits.

ME 496 Special Projects
An in depth study of selected topics of particular interest to the student and instructor. Three credits.

ME 550 / ME 551 Thesis I, II
The master's thesis is intended to be a test of the student's ability to formulate a problem, solve it, and communicate the results. The thesis is supervised on an individual basis by a faculty member. A thesis involves the ability to gather information, examine it critically, think creatively, organize effectively, and write convincingly; it is a project that permits the student to demonstrate skills that are basic to both academic and work in industry. The student must also submit a paper for possible inclusion in a refereed journal appropriate to the topic. Three credits each.

Graduate Certificate in Automated Manufacturing

Courses DM 405 and DM 430 are described under MOT.

MF 440 Computer Aided Manufacturing (CAM)
The course balances CAD and CAM with up-to-date information on rapid prototyping, solid modeling systems, and Web-related issues. Management of an effective product design from a business perspective is introduced: reducing material, tolling, setup and waste costs. An integration in a factory automation environments is also explored. Mathematical terminology and the concepts are explained in as intuitive a way as possible. The course also covers components of CAD/CAM/CAE Systems and CAD/CAM postprocessor development manufacturing systems. Students are required to have a background in programming, calculus, and matrix and vector algebra. The course consists of lectures, group discussions, case studies, a term project, computer simulation, and laboratory. (Prerequisite: N/A) Three credits.

MF 450 Advanced Programmable Logic Control Systems (PLC)
In this course, students are introduced to the design and implementation of programmable logic controllers for use in industry in the areas of automation, manufacturing, and other related uses. Students examine Programmable Logic Controllers while concentrating

on relay ladder logic techniques and how the PLC is connected to external components in an operating control system. State-of-the-art software is used, including MultiSim, LabView, Cosivis,Veep, and RS Logix 500. Course covers: input/output ports, continuous process control, timing and counting functions, chaining sequences, and digital gate logic Computer Aided Analysis and Design. Three credits.

MF 454 Product and Process Design for Manufacturing
Students learn the principles of product design for optimizing product manufacture and assembly - an essential part of the concurrent engineering process. The course examines materials and processes used in part manufacture and designing for manual and automated assembly processes. A course project applies these principles. (Prerequisite: ME 311 or equivalent) Three credits.

MF 461 Automation and Robotics I
This course introduces the basic elements of automation, industrial robotics, automated work cells, common information model systems, and the automated factory. Topics include kinematics, dynamics, the classification of robots, automation sensors, work cells, import systems and programming, robot/system integration, economic justification, and applications. (Prerequisite: ME 203 or equivalent) Three credits.

MF 462 Automation and Robotics II
This course introduces components of the automated factory. Topics include design of parts and processes for automation, hard and flexible automation, blocks of automation, automatic production and assembly, numeric controllers, computer-aided design/computer-aided manufacturing, industrial logic control systems, programmable logic controllers, and computer applications in automation. (Prerequisite: MF 361 or equivalent) Three credits.

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