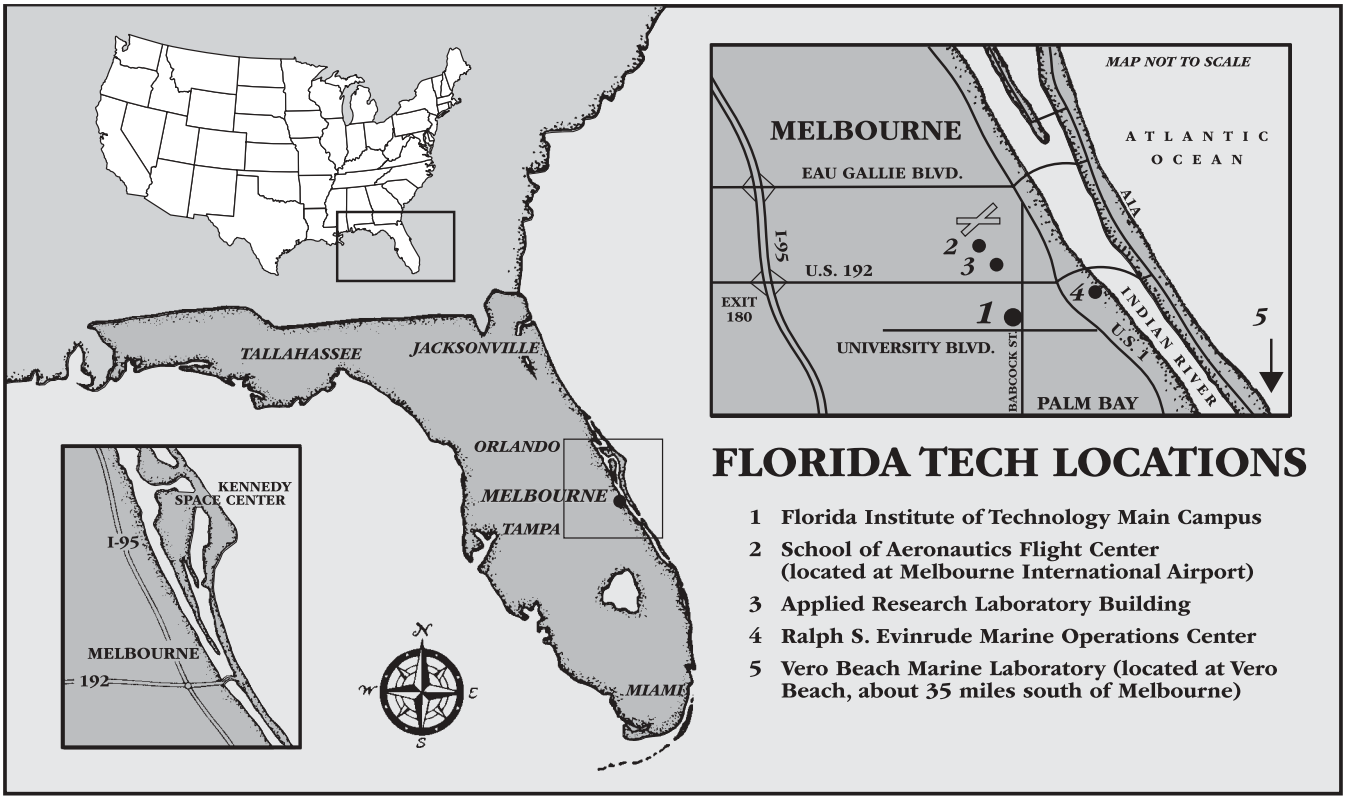
Florida Institute of Technology

2003–2004 University Catalog



Florida Institute of Technology is an accredited, coeducational, independent university committed to the pursuit of excellence in teaching and research in the sciences, engineering, management and related disciplines, as well as providing the challenges that motivate students to reach their full academic and professional potential. The university offers over 150 degree programs in science and engineering, aviation, business, psychology and communication. Doctoral degrees are offered in 22 disciplines, while master's degrees are offered in more than 60 areas of study.

The campus is located in Melbourne (population 65,000), on Florida's east coast. The area offers a delightful year-round subtropical climate and inviting ocean beaches. The Kennedy Space Center and Walt Disney World are within an hour's drive from Melbourne.

For additional information, or to arrange for a campus visit, call us toll free at

(800) 888-4348 (Undergraduate Admission)
(800) 944-4348 (Graduate Admissions)

or write:

Florida Institute of Technology
150 West University Boulevard
Melbourne, FL 32901-6975

or contact us by E-mail:

admissions@fit.edu (Undergraduate Admission)
grad-admissions@fit.edu (Graduate Admissions)

or by fax: (321) 723-9468

Visit our homepage (URL) http://www.fit.edu

Florida Institute of Technology

Mission Statement

Florida Institute of Technology is an independent technological university that provides quality education, furthers knowledge through basic and applied research, and serves the diverse needs of our local, state, national and international constituencies.

In support of this mission, we are committed to

- creating an organizational culture that values and encourages intellectual curiosity, a sense of belonging and shared purpose among faculty, students and staff, and pursuit of excellence in all endeavors;
- recruiting and developing faculty who are internationally recognized as educators, scholars and researchers;
- achieving recognition as an effective, innovative, technology-focused educational and research institution;
- recruiting and retaining a high-quality, highly selective and culturally diverse student body;
- continued improvement in the quality of campus life for members of the university community;
- providing personal and career growth opportunities for both traditional and nontraditional students and members of the faculty and staff.

Table of Contents

This catalog contains current information regarding curricula, educational plans, offerings and requirements of the colleges and schools, including the Graduate School, and may be altered from time to time to carry out the purposes and objectives of the university. The provisions of this catalog do not constitute a contract between the university and the enrolled student; the university reserves the right to change any provision, offering requirement or fee at any time.

A student may be required to withdraw (under appropriate procedures) whenever it is deemed to be in the best interest of the student and/or the university. The university may impose probation on any student whose conduct is unsatisfactory. Any admission based on false statements or documents presented by the student is void when the fraud is discovered, and the student is not entitled to credit for work that may have been completed. When a student is dismissed or suspended from the university for cause, there will be no refund of tuition and fees paid. If a dismissed student has paid only a part of the tuition and fees, the balance due the university will be collected.

There will be no refund of tuition, fees or other payments made in the event the operation of the university is suspended as a result of any act of God, strike, riot, disruption or for any other reason beyond the control of the university.

Florida Institute of Technology does not discriminate on the basis of race, color, sex, disability, age, or national or ethnic origin in admission of students, administration of its educational policies, scholarship and loan programs, employment policies and athletic or other university-sponsored programs or activities.

Welcome to Florida Tech

Academic Calendar

Fall 2003

Aug. 1	Tuition and fees due for Fall Semester 2003
Aug. 25	CLASSES BEGIN (Monday)
Aug. 25–27	Financial Aid sign in
Aug. 29	Last day to register or add a class
Sept. 1	Holiday
Sept. 5	Last day to drop a class with full tuition refund and without receiving a grade of W
Sept. 26	Last day to file a Petition to Graduate for Spring Semester 2004 without a late fee
Oct. 17	Last day to withdraw from a course with a final grade of W
Nov. 10	Registration for Spring Semester 2004 begins
Nov. 27–28	Holiday
Dec. 5	Tuition and fees due for Spring Semester 2004
Dec. 6	Last day of classes
Dec. 8–13	FINAL EXAMS
Dec. 13	Fall Commencement Exercises

Spring 2004

Dec. 5	Tuition and fees due for Spring Semester 2004
Jan. 7	CLASSES BEGIN (Wednesday)
Jan. 7–9	Financial Aid sign in
Jan. 13	Last day to register or add a class
Jan. 16	Last day to file a Petition to Graduate for students who plan to complete their requirements by the end of Summer Term 2004
Jan. 20	Last day to drop a class with full tuition refund and without receiving a grade of W
Feb. 2	Re-petition deadline for Spring Semester 2004 (for students who had petitioned for an earlier graduation)
Feb. 2	Registration for Summer Term 2004 begins
Feb. 27	Last day to withdraw from a course with a final grade of W
March 1–5	Spring Break
March 15	Priority deadline for filing Financial Aid Applications for 2004–2005
March 29	Registration for Fall Semester 2004 begins
April 9	Last day to file a Petition to Graduate for Fall Semester 2004 without a late fee
April 23	Tuition and fees due for Summer Term 2004
April 24	Last day of classes
April 26–May 1	FINAL EXAMS
April 30	Re-petition deadline for Summer Term 2004 (for students who had petitioned for an earlier graduation)
May 1	Spring Commencement Exercises

Summer/Fall 2004

May 10	SUMMER CLASSES BEGIN (Monday)
May 10–12	Financial Aid sign in
May 14	Last day to register, add a class, or drop a class with full tuition refund and without receiving a grade of W
May 31	Holiday
June 11	Last day to withdraw from a course with a final grade of W
July 2	Last day of 8-week classes (final exam on last scheduled class day)
July 5	Holiday
July 23	Last day of 11-week classes (final exam on last scheduled class day)
July 30	Tuition and fees due for Fall Semester 2004
Aug. 30	FALL CLASSES BEGIN (Monday)
Aug. 30–Sept. 1	Financial Aid sign in

The University

Florida Institute of Technology is an accredited, coeducational, independently controlled and supported university. It is committed to the pursuit of excellence in teaching and research in the sciences, engineering, technology, management and related disciplines, as well as providing the challenges that motivate students to reach their full academic and professional potential. Today, over 4,500 students are enrolled, with more than 3,000 students on the Melbourne campus and about 1,400 at Florida Tech's off-campus graduate centers. All of the off-campus students and more than 850 on-campus students are enrolled in graduate programs. Florida Tech offers more than 130 degree programs in science and engineering, aviation, management, humanities, psychology and communication. Doctoral degrees are offered in 22 disciplines, while more than 60 master's degrees are offered.

Because of the moderate size of the student body and the university's dedicated faculty and staff, a student at Florida Tech is recognized as an individual. Acting as individuals or as members of student organizations, students are encouraged to express their opinions on ways in which academic programs and student life might be made better for all. An active student government and student court plays a meaningful part in matters affecting student life.

Many students enrolled in graduate programs, as well as some undergraduates, take part in sponsored research programs and make significant contributions to project results. Florida Tech houses a number of research institutes and centers that, in collaboration with academic departments, aid in the students' training. These institutes and centers are described more fully in the *Research: Institutes, Centers and Major Laboratories* section of this catalog.

The university is organized into six academic units: the College of Engineering, College of Science and Liberal Arts, School of Aeronautics, School of Management, School of Psychology and School of Extended Graduate Studies.

The **College of Engineering** includes six departments: chemical engineering, civil engineering, computer sciences, electrical and computer engineering, mechanical and aerospace engineering, and marine and environmental systems. Programs offered in addition to those included in the department names are biological oceanography, chemical oceanography, coastal zone management, computer information systems, engineering management, environmental resource management, environmental science, geological oceanography, marine environmental science, meteorology, ocean engineering, physical oceanography, software development and software engineering.

The **College of Science and Liberal Arts** is composed of the departments of biological sciences, chemistry, mathematical sciences, physics and space sciences, science education (including mathematics education), and humanities and communication. Bachelor's degrees are offered in all of these areas and in biochemistry, interdisciplinary science and military science. Master's degrees are offered in applied mathematics, biological sciences, chemistry, computer education, environmental education, mathematics education, operations research, physics, technical and professional communication, science education and space sciences. The Specialist in Education degree is offered by the science education department. Doctoral degrees are offered in applied mathematics, biological sciences, chemistry, mathematics education, operations research, physics, science education and space sciences.

In addition to the degree-granting departments listed above, the college also includes the Division of Languages and Linguistics within the humanities department and the military science department (Army ROTC). The university offers two- and four-year Army ROTC programs to interested, qualified students. Students may qualify for a reserve commission in the U.S. Army through normal completion of both the college basic and advanced cadet programs, or may enter directly into the advanced program after completing their basic program requirements before entering the university.

The **School of Aeronautics** offers bachelor's degrees in aeronautical science, aviation management and aviation meteorology (with flight options available in each program) and aviation computer science; a master's degree in aviation with two options—airport development and management, and applied aviation safety; and a master's degree in aviation human factors.

The **School of Management** offers both bachelor's and master's degrees in business administration, and bachelor's degrees in accounting, business and environmental studies, and management information systems. An accounting track in the M.B.A. program is offered for individuals who have completed a four-year degree in accounting and require additional credits to meet the 150-hour requirement to qualify for the CPA exam in Florida, or to receive reciprocal licensure in Florida from another state.

School of Management students are prepared to compete in a global, technologically driven business environment by integrating personalized and applied business instruction into a focused, high-quality academic learning experience.

The **School of Psychology** offers bachelor's degrees in psychology, master's degrees in applied behavior analysis and industrial/organizational psychology, and doctoral degrees in clinical psychology and industrial/organizational psychology.

The **School of Extended Graduate Studies** began in August 1972 as "Off-Campus Programs," when 42 students enrolled in a master's degree program in electrical engineering at the Naval Air Test Center, Patuxent River, Maryland. Today master's degree programs are offered at ten graduate centers in five states. Curricula and course content are tailored to meet the needs of the students and their employers, while maintaining the highest possible academic quality and integrity. Class times and locations are selected for the convenience of the students. Since 1972, over 11,000 Florida Tech master's degrees have been conferred on off-campus candidates.

In all programs, Florida Tech believes in helping well-motivated students to use every opportunity to learn self-reliance in developing their skills and knowledge to the highest individual potential. The academic programs at the university provide a vigorous challenge to those in quest of answers to unsolved questions.

History

Founded in 1958 as Brevard Engineering Institute by Dr. Jerome P. Keuper, Florida Institute of Technology initially offered continuing education opportunities to scientists, engineers and technicians working at what is now NASA's John F. Kennedy Space Center. The new school grew quickly, in many ways paralleling the rapid development of space technology that was taking place at Cape Canaveral. In 1966, the name was changed to Florida Institute of Technology to acknowledge its growing identity as a scientific and technological university, the only such independent institution in the Southeast.

From its inception, Florida Tech has shown its commitment to graduate education. An article in the New York Times in 1962 described Brevard Engineering College as "the only space engineering college in the country…Its graduate course offers engineers the opportunity to obtain a master's degree and keep up with the advancement taking place daily at the Cape." Originally, all graduate students attended classes on a part-time basis, but at present approximately one-half of the on-campus graduate students attend class and carry out research full time.

The university moved to its current Melbourne campus in 1961, and construction began immediately on administration and classroom buildings to augment existing buildings that had been used by the former University of Melbourne. From that beginning, growth of the campus has been ongoing through the years, as shown on the campus map at the end of this catalog.

More than 35,000 degrees have been earned by students at Florida Institute of Technology. As the institution advances and the alumni ranks multiply, the university remains dedicated to developing concerned scientists, engineers and business leaders who will make positive contributions to our society.

Accreditation and Memberships

Florida Institute of Technology is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (1866 Southern Lane, Decatur, GA 30033-4097; (404) 679-4501) to award the associate of science, bachelor of arts, bachelor of science, master of science, master of business administration, master of health administration, educational specialist, doctor of psychology and doctor of philosophy degrees.

The university is approved by the Office of Education of the U.S. Department of Education.

The university is a member of the Independent Colleges and Universities of Florida, the American Council on Education, the College Entrance Examination Board and the American Society for Engineering Education.

The undergraduate programs accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology are aerospace engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, mechanical engineering and ocean engineering. The undergraduate computer science program is accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology.

The university is approved by the State of Florida Department of Education for teacher education in secondary science and mathematics at the bachelor's, master's and doctoral degree levels. Selected courses are approved for credit toward recency-of-credit, extension, reissuance or reinstatement of certificates.

The undergraduate program in chemistry is accredited by the Committee on Professional Training of the American Chemical Society. Students may obtain ACS-certified degrees by following a prescribed curriculum.

The aeronautical science, aviation computer science and aviation management programs are accredited by the Council on Aviation Accreditation.

The Doctor of Psychology, Clinical Specialization, is accredited by the American Psychological Association.

Operation and Control

Florida Institute of Technology was granted a charter as a nonprofit corporation by the State of Florida in December 1958. The corporate charter established the school as an independent institution of higher learning with academic programs leading to undergraduate and graduate degrees. The charter ensures that the university will be coeducational in character and that admission will be open to all qualified applicants regardless of race, creed, age, sex, color or disability. Under the corporate charter, control of the university is vested in a self-perpetuating board of trustees. Members of the board are selected on the basis of outstanding ability, integrity and personal interest in the development and preservation of the university.

Financial Support

The university is supported by tuition and fees, research grants and contracts, and assistance from foundations, industry and the local community. Careful attention to sound business policies has placed the institution on a sound financial basis year after year.

Florida Institute of Technology was ruled tax-exempt under Section 501(c)(3) of the Internal Revenue Code (IRC) of the U.S. Treasury Department in January 1960. The university was classified in October 1970 as an organization that is not a private foundation as defined in Section 509(a) of the IRC. Gifts to the university are thus tax deductible.

Campus Environment

Florida Tech's campus is located in Melbourne, a residential community on Florida's Space Coast. The area offers a delightful year-round subtropical climate and inviting ocean beaches. The Kennedy Space Center and Walt Disney World in Orlando are within an hour's drive from Melbourne.

The university's location on Florida's Space Coast gives it a unique place in the academic world. Corporations whose scientists and engineers are making tomorrow's technological breakthroughs for the U.S. space program surround the Kennedy Space Center. The space center's proximity allows easy interaction between space center personnel and the university community. Moreover, the growing number of high-tech, innovative businesses and industries in the Melbourne area help to make Florida's business environment one of the most promising and exciting in the nation, and enables university professors to stay abreast of the latest challenges and developments in the scientific, technical and business worlds. With both the Indian River lagoon and the Atlantic Ocean nearby, students in the oceanography, aquaculture, environmental science and marine biology programs have ready access to the beaches and waters for a variety of field experiments and research projects. Overall, Florida Tech's location is ideal for keeping pace with developments in science, technology and business.

Facilities

The **Homer R. Denius Student Center** houses the SUB Café and Deli, the bookstore and the campus post office. Located on the second floor is the Office of Student Life, which includes student activities, orientation, residence life and the associate dean of students/director of student life. The All Purpose Room and offices for Student Government (SG), Campus Activities Board (CAB) and other campus organizations are also on the second floor.

The campus **bookstore** in the Denius Student Center sells new and used textbooks, supplies, clothing, magazines and study guides. A wide range of imprinted merchandise is carried, including clothing, umbrellas, notebooks and giftware. The bookstore is open Monday through Friday from 8:30 a.m. –5 p.m. throughout the year and for extended hours and Saturdays at the beginning of each semester. Students may sell their used textbooks year-round at the bookstore with a Florida Tech student ID card. Textbooks may be reserved via the bookstore's Web site at www.bkstore.com/fit/ using the "Online Textbook Reservation Form" to submit a class schedule directly to the bookstore. Books reserved by this means are held until the first week of classes. An order-by-phone service is also available.

University **residence halls** provide a variety of accommodations including single-sex and co-ed halls, with both community and private or en suite bathrooms. Each residence hall room and apartment is equipped with two Ethernet connections to the university's fiber-optic network. **Southgate Apartments** offer studio, 1-, 2- and 3-bedroom apartment options for upper-division students. Priority for all rooms in these facilities is given to undergraduate students. Six new three-story residential buildings for upper-division and graduate students and a common building, located on five naturally wooded acres next to the campus's botanical garden, are in progress. The residential buildings will provide large apartments for four students each, and the common building will feature meeting rooms and laundry facilities, a student lounge, and the resident director's office.

The **Botanical Garden**, a lush Florida forest of palm, water oak and tropical vegetation, comprises one-fifth of 130 acres of partially wooded, beautifully landscaped campus. Visitors can enjoy leisurely walks on the pathways through this garden. One path, the Dent Smith Trail, is named in honor of the man who founded the Palm Society and contributed significantly to the university's palm collection. More than 200 species of palm, some quite rare, are found on the campus.

The **Charles and Ruth Clemente Center for Sports and Recreation** is a $6.8-million sports complex that opened in fall 2001. The 57,250-sq.-ft. facility houses varsity and intramural basketball courts, a racquetball court, a complete fitness center, group fitness room, walking track, volleyball and badminton courts, the Center Court food services area, men's and women's locker rooms, an equipment checkout area and two multipurpose meeting rooms. The 5,000-sq.-ft. weight and fitness area is equipped with cardiovascular machines including treadmills, elliptical machines, exercise bikes and stair-climbers, free weights and selectorized weight equipment. Recreation and athletics department offices are also located in the facility. The Clemente Center hires student staff to work in the facility throughout the year.

The 500-seat **W. Lansing Gleason Performing Arts Center** is designed for stage plays, musical productions, scientific displays, lectures, seminars, camps and conferences. It is equipped with a complete control booth for professional stage facilities, lighting and sound. The facility is equipped with both C- and KU-band and digital satellite downlink services that can be incorporated into productions and viewed on a large screen. Situated in the central portion of the campus, the center is a cultural asset to the university and surrounding community.

The **Jerome P. Keuper Administration Building** houses the offices of the vice president for student affairs and dean of students, financial aid, international student and scholar services, career services and cooperative education. Also located in this building are the offices of graduate and undergraduate admission.

The 65,000-square-foot **John H. Evans Library** is centrally located adjacent to the Learning Pavilion, which houses the Applied Computing Center, Academic Support Center and a teaching auditorium. The library's Web-based LINK (Library Information Network) is accessible from on campus and remotely. The LINK (www.lib.fit.edu) provides an online catalog, electronic journals, citation and full-text databases and electronic gateways to library catalogs and information resources worldwide. Electronic resources include CD and DVD resources, ProQuest, FirstSearch, Ingenta, Engineering Village 2, PsycINFO, and Literature Resource Center. These online resources complement the print collection, extensive holdings in government documents, audiovisual materials, a media viewing and distribution center and a classroom equipped for multimedia presentations. Library faculty and staff support faculty and students with specialized instruction and ongoing assistance with information access.

Current holdings comprise more than 106,000 books, more than 202,000 government documents, and an extensive collection of technical journals including nearly 7,000 current print and electronic subscriptions. The library participates in the Federal Depository Library Program, which makes federally produced information available to the public free of charge. The library is a member of the American Library Association, the Florida Library Association, the Central Florida Library Cooperative, the Library Association of Brevard, the Online Computer Library Center (OCLC) and the Southeastern Library Network (SOLINET).

Of particular interest to undergraduate students is the Research Sources and Systems (COM 2012) course, offered by research and instruction librarians. This one-credit course is designed to familiarize the student with a variety of strategies, services and sources, emphasizing traditional and electronic research tools available in the students' major fields. The skills and knowledge gained in this course enable a student to use library resources effectively for lifelong learning.

The seven-story **Crawford Building** provides space for modern laboratories, classrooms and faculty offices for the mathematical sciences, physics and space sciences, and humanities and communication departments. Also in the Crawford Building are the offices of the chief academic officer, the vice president and associate vice president for research and information technology, and their staffs.

The **Edwin Link Building** accommodates chemistry, environmental sciences, oceanography and ocean engineering.

The **F.W. Olin Engineering Complex** houses all departments of the College of Engineering with the exception of the department of marine and environmental systems, which is housed in the Link Building. This three-story facility includes 26 specialized research and teaching laboratories and a 145-seat multimedia lecture hall.

The **F.W. Olin Life Sciences Building** is the home of the biological sciences programs. This two-story facility contains eight teaching laboratories and 12 research laboratories that were designed with "flex space" for customizing the areas to meet the needs of specific activities.

The **F.W. Olin Physical Sciences Building**, slated for completion in fall 2004, will house the offices of the dean of the College of Science and Liberal Arts, 25 chemistry, physics and space sciences laboratories, a high-bay research area, an observatory with a 24-inch telescope and a rooftop deck area that will accommodate up to 12 additional telescopes.

The **Shephard Building** is the home of the science education department.

George M. Skurla Hall is the home of the School of Aeronautics. It is a modern two-story building that includes faculty offices, classrooms, laboratories in air traffic control, advanced systems and computers, and a 125-seat auditorium. The flight training department is located nearby at the Melbourne International Airport.

Separate academic buildings on campus are dedicated for use by the **School of Management** and **School of Psychology**.

Services

The **Information Technology** department provides services to the campus community that include E-mail, Web and other computer accounts, common computing facilities, technology support, network services, telephone services, copy services, Web services and instructional technologies. Information on these services is available on the Information Technology Web site, http://www.it.fit.edu, or by E-mail request to info@it.fit.edu.

All residence halls are wired for network and Internet access, and students are assigned E-mail accounts upon enrollment in classes.

The **Office of Career Services** personnel assist students in obtaining professional, career-oriented, permanent employment. Assistance in résumé writing, interviewing techniques and career counseling is available. An updated Career Resources Library is also available for student use. Current job listings are posted in prominent areas throughout the campus, in major academic units and on the career services Web site. As part of career services, a résumé referral program is available for all students registered with this office. Relevant workshops are presented throughout the year.

Career services maintains an interview schedule throughout the academic year. Students must be registered with the office for on-campus interviews with recruiters from companies seeking employees with specific academic backgrounds.

Career services annually presents two career fairs that highlight professionals, agencies, corporations and services from throughout the United States.

Summer internships are also listed by the Office of Career Services, and assistance is provided for local, national and international searches of internship listings and information on employers.

Conference and special events services offered through the Office of Auxiliary Services are designed to assist all academic units, faculty, staff, students and the general public in hosting meetings, conferences, banquets and special events at the university. For further information, please contact the conference and events office, located on the ground floor of Evans Hall.

The **cooperative education program** at Florida Tech is designed to prepare students for professional careers through productive work experiences in fields related to their academic or career goals. It provides progressive experiences in integrating theory and practice. The co-op goals are to provide curriculum-related employment opportunities for students before their graduation; to provide a program containing structured work experience that will be beneficial to students in terms of both their personal and professional growth; and to assist employers in the recruitment process. Co-op is a partnership among students, educational institutions and employers.

The cooperative education program is open to all majors. Two co-op plans are offered to students. The conventional plan integrates alternating periods of full-time paid work experience with full-time academic study. The parallel plan incorporates part-time paid work experience simultaneously with a part-time academic course load.

Students participating in the university's cooperative education program (CWE 1001, CWE 2001, CWE 3001 and CWE 4001) receive free elective credits that in some cases may be applied toward degree requirements. They are classified as full-time students.

Availability of co-op employment opportunities varies considerably from field to field. For further co-op information, contact the assistant director in the Office of Career Services and Cooperative Education, room 210, Keuper Administration Building, or call extension 8102.

Counseling services of Florida Tech are designed to assist students with educational, vocational, financial, social and personal problems. The services available include:

The **Academic Support Center** (ASC) helps undergraduates with academic difficulties by providing counseling directed toward both their studies and campus life as it relates to their studies. The staff responds to students' academic concerns by offering information and referral services.

Counseling and Psychological Services (CAPS) provides services for students and their families. The services include personal and marital counseling and vocational and career counseling, as well as programs for personal development and enrichment, and when necessary, referrals to community public services agencies. All services are provided under the direction of a licensed psychologist. Professional standards of practice are maintained and, in all cases, student contacts with the group are strictly confidential. Services provided by the center are free of charge. Located on the corner of Country Club Road and West University Boulevard, Counseling and Psychological Services is open Monday through Friday from 8 a.m. to 5 p.m.

A **faculty adviser** is assigned to each student to assist in selecting the proper courses to achieve academic goals and ensure timely graduation. The faculty adviser also assists with any academic problems the student may have.

The **Holzer Health Center** is operated by OMNI Healthcare, a private medical provider. All full-time and part-time students may use this facility and receive free office visitation and consultation. Students may use their university student health insurance or third-party insurance (in accordance with their health insurance policy provisions) along with personal funds to pay for any additional services provided by OMNI Healthcare.

The health center provides medical services covering a wide range of health care needs including routine illness, minor injuries, radiology and diagnostic services, and works to protect the student body from the spread of communicable diseases. The health center cannot accept responsibility for prolonged illness or chronic diseases. When necessary, students are referred to other medical specialists and/or hospitalized in the Melbourne area.

All students must provide a completed medical history report, certified by the signature of the student's doctor or nurse, including proof of the required immunizations, whether or not they plan to use the health center.

The **international student adviser** provides overall guidance to international students attending the university and will assist in resolving any problems that may arise. The staff of the Office of International Student and Scholar Services can answer questions related to university experiences and adaptation to living in the United States. Florida Tech's International Student Service Organization works with the international student adviser to provide new students with a comprehensive orientation.

The international student adviser is also responsible for reissuing the certificates of eligibility (the I-20 and IAP-66) of an attending student needed in maintaining student visas and other immigration forms. The adviser is in contact with embassy and foundation sponsors, and processes forms required by foreign governments regarding student status. International students should report to this office with their passports upon arrival on campus, and again at least three weeks prior to any vacation period involving travel outside the United States to request paperwork for reentry.

Florida Tech's **Office of Residence Life** is committed to supporting and enhancing the academic mission of the university. Residence life works with the Offices of Auxiliary Services and Facilities Management to ensure clean, comfortable and well-maintained residence halls.

The residence life program includes all of the student life aspects of residential facilities and the formulation and interpretation of all policies and procedures affecting students in residence. It also includes all counseling and student conduct concerns, programming and community development. The emphasis is on providing living and learning experiences from which people can grow. The major role of the Office of Residence Life is to support and enhance the development of the personal as well as academic life of students while they are at Florida Tech.

The **Office of Student Employment** assists students in obtaining employment while they are enrolled at the university. Assistance is provided with part-time on- and off-campus employment, résumé critiques, interviewing techniques and job search strategies. Many students find interesting and rewarding jobs that not only help pay their bills, but provide the opportunity to build a base of experience for their future careers. The Office of Student Employment is located on the second floor, Keuper Administration Building, room 205.

The Federal Work Study (FWS) program is a federally funded program providing students with part-time, on-campus employment. Only students who receive financial aid are eligible for this program. Work-study awards are made by the Office of Financial Aid based on need and dependent upon available funds, so it is highly recommended that a Free Application for Federal Student Aid (FAFSA) be submitted early. Students receiving FWS employment report to the Office of Student Employment at the beginning of each academic year. There are a variety of work-study job opportunities.

The FWS Community Service program exists within the Federal Work-study program. It provides off-campus part-time jobs to eligible students in nonprofit community organizations. Available positions vary each semester, and may be major-related or clerical.

The Job Location and Development (JLD) program is a federally funded program to assist currently enrolled students in obtaining off-campus employment. It is a free service to both students and employers. Available jobs in the local community are posted on the JLD job board in the Keuper Administration Building as well as on the OSE Web site at www.fit.edu/ProsStud/employ. Students are urged to visit the Office of Student Employment to learn more about the positions. The only participation requirements are that students fill out data sheets to register with the program prior to receiving referrals, and that students who obtain off-campus positions notify the Office of Student Employment. Some of the positions typically listed include computer programmers, engineering aides, office assistants, food servers, retail clerks, landscapers and child caretakers.

The College Roll Program provides on-campus employment for currently enrolled students. Positions are temporary part-time jobs and are not based on student need.

The **Office of Veterans Affairs**, located in the Office of the Registrar, has a coordinator available to assist veterans and their dependents with both university and VA-related matters. In addition to providing information regarding VA educational benefits, tutorial assistance and employment services, the office offers individual counseling and referrals.

The **Office of Auxiliary Services** coordinates many campus services including four food operations, catering, student housing business operations, the bookstore, campus vending, ATMs, ID cards, campus scheduling and the Gleason Performing Arts Center.

Evans Dining is located in the Residence Quad, on the second floor of Evans Hall. It is an "all you care to eat" cafeteria that offers a variety of homemade entrees, short-order grill, cook-to-order stir-fry station, deli, hot and cold buffet bar, and dessert and beverage bars. Bag lunches are available if ordered in advance. Evans accepts meal points, FlexCash, Panther Cash, cash and major credit cards. Serving hours are Monday–Friday breakfast, 7 a.m.–11 a.m.; lunch, 11 a.m.–2 p.m.; dinner, 4 p.m.–7 p.m.; Saturday and Sunday continental breakfast, 8:30 a.m.–10:30 a.m.; brunch, 10:30 a.m.–2 p.m.; dinner, 4 p.m.–7 p.m.

The **SUB Café and Deli** in the Denius Student Center is a comfortable, casual dining spot in the heart of campus. It features a variety of daily specials, soup and salad bars, full grill service, desserts and fresh-baked cookies, along with a deli sandwich shop. **Pete's Java Den** offers cappuccino, espresso, latte, mocha and many gourmet coffees. The SUB Café accepts FlexCash, Panther Cash, cash and major credit cards. SUB Café hours are Monday–Thursday, 7:30 a.m.–5 p.m.; Friday, 7:30 a.m.–3 p.m. Pete's Java Den hours are Monday–Thursday, 7:30 a.m.–10 p.m.; Friday, 7:30 a.m.–4 p.m.

The **Rathskeller Eatery and Pub** on the ground floor of Evans Hall offers fresh-baked pizza, burgers, deli subs, hand-dipped Edy's ice cream and freshly baked gourmet cookies. The "Rat" offers late night dining with big-screen TV and a game room, pizza delivery, and a mini convenience store that offers a number of frozen entrees and food items that can be purchased for the microfridges located in each residence hall room. The Eatery and Pub accepts FlexCash, Panther Cash, cash and major credit cards. Rathskeller Eatery hours are Monday–Friday, 11 a.m.–11:30 p.m.; Saturday and Sunday, 5 p.m.–11:30 p.m. Pub hours vary.

Center Court on the first floor of the Clemente Center for Sports and Recreation serves the south side of campus. Green Mountain Coffees, breakfast sandwiches and pastries, and a variety of lunch entrees from fresh salads and wraps to personal pizzas and panini grilled sandwiches are featured. Center Court accepts FlexCash, Panther Cash, cash and major credit cards. Center Court is open Monday–Friday, 8 a.m.–8 p.m. and during Panther home games.

Co-curricular Activities

Florida Tech hosts more than 80 student organizations for students to join and hold positions of leadership. Organizations represent the varied interests of Florida Tech's students. These interests include student governance, social programming, cultural education and appreciation, fraternity/sorority membership, political and religious development, dance, music and theatre performance, academic and honor organization involvement, science fiction/historical role playing and participation in athletic club team sports.

New campus organizations are formed annually based on student interest. All organizations are supported by the Office of Student Activities and a faculty/administrative advisor. Organizations are provided leadership training and recognition throughout the year.

The university provides **varsity athletics and intramural and recreational activities** for students. Florida Tech is a member of the National Collegiate Athletic Association (NCAA) Division II and competes in the Sunshine State Conference. Men's sports include baseball, basketball, crew, cross country, golf, soccer and tennis. Women's sports include basketball, crew, cross country, golf, soccer, softball, tennis and volleyball.

Intramural team sports include flag football, softball, volleyball, cricket, basketball, soccer and inner tube water polo. Individual intramural sports are tennis, running, golf, weight lifting, racquetball, badminton and table tennis.

The 57,250-sq.-ft. Clemente Center for Sports and Recreation (see page 5) offers abundant opportunities for a variety of sports and recreational activities.

Two swimming pools, soccer fields, baseball and softball diamonds, four regulation tennis courts and two four-wall racquetball courts are located on campus. Nearby are two 18-hole golf courses. Students are welcome to use these facilities and to take advantage of many other recreational opportunities afforded by the warm, sunny climate, the

Atlantic Ocean and the natural waterways in Brevard County. Surfing, water skiing, swimming, boating and fishing are popular activities throughout the area.

The All Faiths Center and the United Campus Ministry office are located at the southern end of the campus on Babcock Street (adjacent to the Psychology building). The center is open to all students as a place to pray, meet friends and consult with volunteer campus ministers who serve in an educational consortium. The United Campus Ministry serves as a clearinghouse for all religious activities.

Study Abroad

A variety of study-abroad opportunities are available at Florida Tech, including programs with European partner institutions. One of these programs permits Florida Tech students to take Florida Tech courses—essentially the same courses they would take in Melbourne—at CERAM EAI Tech, located in Sophia Antipolis, a high-tech community on the Cote d'Azur near Nice, France. This institute prepares students from France and other countries for entry into the junior year of nearly all Florida Tech programs by offering them the same curricula they would take during the first two years in Melbourne. As a result, students who start their programs in Melbourne have an opportunity to study in Sophia Antipolis for a semester or full year to take second-year (and certain third-year) Florida Tech courses, in English, while at the same time gaining knowledge and experience of a different culture and preparing for full participation in the global business and technology community of the twenty-first century.

Study abroad opportunities also exist at other Florida Tech partner schools, including the Norwegian School of Management (NSM/BI) in Oslo, Norway, and the Ecole Nationale de l'Aviation Civile (ENAC) in Toulouse, France. English is the language of instruction for all courses at NSM/BI, and for certain master's programs at ENAC. Other study-abroad programs have been designed to enable Florida Tech students to earn European diplomas. In France, programs at both ENAC and the Ecole Internationale des Sciences du Traitement de l'Information (EISTI) in Cergy-Pontoise, near Paris, allow students to earn French engineering diplomas along with Florida Tech bachelor's and master's degrees in several fields of engineering, computer science, computer information systems and aviation. For students who are already competent in French prior to the first semester overseas, the full program can be completed in seven years or less.

Additional information on these programs and others may be obtained from the Office of International Academic Programs.

Expenses and General Information

Tuition

Tuition and other charges for 2003–2004 will not be finalized until presented to and approved by the university's board of trustees in January 2003, and will be available thereafter through Florida Tech's online catalog at www.fit.edu/Pros-Stud/undergrad/admissions. A hard-copy schedule of tuition and other charges may also be obtained by contacting Florida Institute of Technology, Office of Admission, 150 W. University Blvd., Melbourne, FL 32901-6975; or the Office of Student Accounting at the same address.

Tuition for full-time undergraduate students (12–19 credit hours) is charged on a semester basis. Semester tuition rates apply to the fall and spring semesters only. Summer tuition and tuition for part-time students and all graduate students, except those seeking the Psy.D. degree, is charged on a credit hour basis.

Tuition for students enrolled in the School of Extended Graduate Studies is published separately in the course catalogs for each off-campus site.

For students enrolled in AVF courses, flight fees are charged in addition to tuition. Flight training in all ratings is also offered to persons who desire to proceed at an accelerated or slower pace relative to the AVF sequence. Those desiring this training need not be registered in the university program. For information on courses and prices, please contact F.I.T. Aviation, 640 S. Harry Sutton Road, Melbourne, Florida 32901.

Housing and Board Information

Freshman Residency Requirement

Studies have shown that living in a residence hall during a student's freshman year is the most important environmental characteristic associated with finishing college. In fact, residing on campus has been reported to add 18 percent to a freshman student's chances of finishing college. To that end, Florida Tech has developed an educationally sound policy requiring all first-time freshmen* and students who have earned less than 24 credit hours to reside in the university residence halls and participate in one of the designated freshman meal plans. Exemptions to the policy are made only for those students who are over the age of 21, married, single parents living with their child or children, students who have been enrolled full time in an intensive English program in the United States for three months or more, or local resident students living full time in the local area with a parent or legal guardian over the age of 21.** Students requesting an exemption must submit a First Year Residency Requirement Release Request (available from the Office of Residence Life) with any supporting documentation to the associate dean of students/director of student life. Requests received after August 1 (for the fall semester) or December 1 (for the spring semester) will not be considered. Students seeking exemption should contact the Office of Residence Life at (321) 674-8080 for more information.

**A first-time freshman is defined as any full-time student who has graduated from high school the previous January, May or June, including those who have earned college credit and/or an associate's degree while enrolled in high school.*

***A local resident student is defined, based on information supplied by the Office of Admission, as any student who has graduated from an area high school within a 40-mile radius of campus, or who is currently residing with parents or legally recognized guardians over the age of 21 who have established full-time residency in the local area for one year prior to the student's admission to the university. A local student meeting these criteria is automatically exempt from the residency requirement, and if on-campus housing is desired, should contact the Office of Auxiliary Services to request it.*

Residence Halls

Students desiring a specific residence hall assignment may submit requests to the Office of Auxiliary Services. Requests for room assignments are honored on a first-come, first-served, space-available basis. Freshmen students are not eligible for housing in Southgate, Evans or Brownlie Halls. After earning 24 semester credits, a student may request housing in Southgate Apartments, or Evans or Brownlie Halls. Because of the high demand for on-campus housing, the university reserves the option to place three students in any residence hall room. If the university exercises this option during the semester, the room occupants receive a prorated adjustment for the semester based on the number of days that triple occupancy occurred.

The Office of Auxiliary Services makes every attempt to grant requests for assignment to certain residence halls, rooms and roommates. However, the university does not guarantee assignment to a specific type of accommodation, building, room or roommate. In all cases, students are billed based on the number of occupants registered for the room (double, single, etc.)

Southgate Apartments

Studio, one-, two- and three-bedroom apartments are available in Southgate Apartments, and are reserved for students with 24 or more earned credit hours. Occupancy ranges from one to four students per apartment, depending on the unit size.

Meal Plans

The FlexPlus meal plans are flexible meal plans offered by the university to make access to food service convenient and cost-effective, using the Student ID card as the access card. Lost or stolen cards must be reported immediately to the Office of Auxiliary Services or any food-service location. Meal plans are contracted with individual students and the benefits are not transferable. All plans are contracted for the entire academic year.

FlexPlus meal plans consist of two major components:

Meal points are used for entry into Evans Dining, our "all you care to eat" dining room located in the Residence Quad. One point equals one meal. As the meal points are used, the balance available declines until it reaches zero or is re-set.

FlexCash is the declining balance portion of the meal plan, and is used like a debit card. It can be used for any food item at any campus location, including select vending machines and pizza delivery. FlexCash carries forward from fall semester 2003 to spring semester 2004 as long as the student is on a meal plan. Any FlexCash remaining after the end of a spring semester is deleted.

Housing and meal service policies that apply to first-year students are presented under "Freshman Residency Requirement."

Deposits

A nonrefundable tuition deposit of $300 is required of each new full-time student to signify intent to enroll in a given semester and to ensure that the university reserves space in its classes. The deposit will be applied to the first-semester bill, or may be applied to an updated entrance semester provided the student notifies the appropriate admission office in writing within two years of the initial date of acceptance.

A housing deposit must be on file in the student's account prior to the student receiving a housing assignment and remain on file for as long as the student lives in university housing. The deposit is not covered by any scholarship or financial aid and cannot be waived. It is refundable, minus any outstanding university charges, provided the terms and conditions of the housing agreement are fulfilled.

Students who sign Florida Tech Residence Hall and Meal Plan Agreements are obligated for the entire academic year.

Payment Policy

In determining the amount due each semester, students may subtract any scholarships, loans or grants that are made directly payable to the university. Students may also subtract any payment plan (e.g., corporate reimbursement plan) under which payments are made directly to the university by sponsoring organizations, and for which the university has been notified in writing of the student's eligibility and acceptance.

All expenses, including tuition, fees, room and board, must be paid on or before the first Friday in August for the fall semester, the first Friday in December for the spring semester, and the last Friday in April for the summer term.

Payments sent by mail should be mailed at least 10 days in advance of the payment due date to assure receipt by the payment deadline. Additional information regarding the university's payment policy can be found in the schedule of classes printed each semester. Payments should be addressed to Florida Institute of Technology, Business Services/ Student Accounting, 150 W. University Blvd., Melbourne, FL 32901-6975.

Student Accounts

Upon payment of the initial tuition deposit, an account is established in the accounting office for the student, using the student's name and the student number assigned by the university as the account identification. Parents desiring to remit payments to the university by mail are encouraged to do so provided the payment is mailed in time to reach the university by the due date. All checks should show the student's name and student number on the face of the check to assure proper credit to the student's account.

If more money than required is remitted, any excess may be refunded or may be left on deposit for the next semester. All refunds will be paid to the student unless otherwise advised in writing. Requests for refunds must be submitted in writing, and will be honored starting on the tenth day following the start of each semester. The cost of books should not be included in payments mailed to the university. Books and supplies are available at the college bookstore and can be purchased by cash, check, approved credit card or the Panther Access Card Debit Account. A student may charge bookstore purchases to his or her account with the university provided it contains sufficient funds to cover such purchases. Students in aviation programs can obtain books at F.I.T. Aviation by check or cash purchases. The university will mail the student an account statement within 30 days following registration. The statement will show itemized charges, payments received and the account balance. A current account statement can also be viewed online using the student's PIN.

Tuition Payment Plan

Florida Tech administers a time payment plan that allows the annual educational expense to be spread over 10 monthly installments. The plan begins in advance of the academic year and carries no finance charge, but does require a yearly administration fee.

Parents and/or students who prefer to pay for educational expenses in monthly installments may want to consider this plan. To determine the yearly budget, calculate all expenses, minus all credits, such as scholarships, grants and/or loans. Books and/or work study payroll programs should not be included in the yearly budget calculation. The yearly budget is then divided into 10 equal payments or divided by five equal payments for one semester participation. The time payment plan is not available for summer terms.

To receive the application form and/or additional information, please contact student accounting by E-mail, studentacctg@fit.edu, or telephone, (321) 674-7428 or toll-free (800) 676-9250.

Veteran Accounts
Veterans who receive allowances directly from the government are responsible for paying their fees and charges on the same basis as other students.

Banking and Check Cashing
To have ready access to funds as needed, students are encouraged by the university to open a checking account in one of the local banks. A new student should bring a cashier's check for deposit in the bank of their choice to avoid a waiting period before funds can be withdrawn. An automated teller machine (ATM) is located in the Denius Student Center.

The student accounting cashier's office will cash personal checks for students in amounts not to exceed $100 at prescribed times during the week. Checks returned for nonsufficient funds (NSF) will result in a fine being charged to the student's account. If a second NSF check is returned, the student will lose check cashing privileges. Students are encouraged to open bank checking and ATM accounts so that they will have continuous access to their funds throughout the academic year.

Panther Access Card ID And Debit Account
The Florida Tech identification card is an integral part of an electronic access system that provides a variety of services to the student. It is required to register for classes, check materials out of the Evans Library, conduct business at the student accounting cashier's office, attend many university functions, and serves as a control for the various meal-plan options. The Panther Access Account is a convenient and cost-effective way to manage expenses while attending Florida Tech. These funds are always available and the card can be used at all food service locations, bookstore, soft-drink and snack machines, washers and dryers, copy machines and printers, and services at the campus mail room. In addition, the card is used for after-hours access to many academic labs and other locations in campus facilities. Funds may be pre-deposited or added at any time from the SUB Café and Deli, Rathskeller or Evans Dining cashiers, bursar's office, auxiliary services office or the automated cash to card machine located in the library. For additional information, please contact the Office of Auxiliary Services.

Payments–Credit Cards
Florida Tech accepts VISA, MasterCard, Discover and American Express credit cards for the payment of amounts due on student accounts. Refunds of credit card payments are credited to the credit card account.

Payments–Part-time Students
All charges for part-time undergraduate and graduate students are due by the payment due date shown in the catalog and semester schedule of classes. Part-time students may register for and attend classes without payment, if

1. the student is sponsored by an employer who will make payments directly to the university, and the employer has furnished a letter to student accounting accepting unconditional liability for all charges not paid by the student, regardless of whether the student completes the course or achieves a minimum grade for the course; or
2. the student has a scholarship, loan or grant, covering 100 percent of all costs, that will be paid directly to the university by the sponsoring organization, and the sponsoring organization has notified the university in writing of the student's eligibility and acceptance.

The student is responsible for submitting all paperwork on time.

If the student's employer will not furnish a statement of unconditional liability, but does make reimbursement directly to the university, then the student is required to make payment to the university at registration. Any amounts subsequently paid by the employer will be refunded to the student.

Registration
Registration is final only after satisfying all financial obligations. A student who is unable to pay by the due date, and has not made prior financial arrangements with the Office of Account Management, may have his or her registration canceled and the class seats made available to other students. A student who registers on or after the first day of classes is charged a $30 late fee. The academic calendar in the front of this catalog lists registration deadlines.

Delinquent Accounts
Each semester, students must meet all financial obligations due to the university, including tuition, fees, traffic/parking fines, library fines, etc. Tuition, housing, board and other charges are subject to audit at any time throughout the academic career of the student. Students who do not make acceptable financial arrangements to pay after they have been notified of the amount due could have their current registrations canceled.

Students with delinquent accounts are not permitted to enroll in succeeding semesters, are not entitled to transcripts and will not be permitted to graduate until they have met all of their financial obligations to the satisfaction of the university.

Refund Policy
Florida Tech provides for a fair and equitable refund policy that meets all applicable federal guidelines governing refunds for tuition, room, board and applicable fees as published in the Federal Register. The refund policy is published in the *Schedule of Classes* prior to the start of each term.

Cancellation of Housing and Meal Plan Contracts
All university housing contracts are for the full academic year. No buyouts and no substitutions are allowed. Students cannot cancel their housing and meal plan contracts after the deadline dates as outlined on the Housing and Meal Plan Contract.

First-time freshmen and new transfer students who withdraw prior to the start of the fall semester must notify the Office of Auxiliary Services in writing, no later than July 15, if they want to have their housing deposits refunded. Students not attending or returning spring semester must notify the Office of Auxiliary Services, in writing, no later than December 1, if they want to receive a refund.

Upper-division students who want to change the meal plan portion of their contracts must submit a written request to the Office of Auxiliary Services by 5 p.m. on the Friday ending the first official week of each semester.

Changing meal plans after the cutoff dates is not permitted except for nonenrollment, official withdrawal, graduation or dismissal from school for the remainder of the academic year. However, a student may opt to increase a meal plan or add FlexCash at any time.

Student Accident and Health Insurance

For academic year 2003–2004, Florida Tech's student health insurance coverage begins August 25, 2003, and ends August 25, 2004.

Domestic Students

Domestic students who are enrolled for six or more credit hours may enroll in the university-sponsored student health insurance plan or waive this charge by showing proof of coverage under a parent's/guardian's or third-party accident and health insurance program from an employer or sponsor, etc. The waiver requires completing the waiver portion of the Student Health Insurance Enrollment and Waiver form and providing proof of coverage (photocopy of both the front and back of their current insurance identification card or a copy of the endorsement page of their current plan). This form, together with proof of insurance, must be submitted to the Office of Auxiliary Services no later than 5 p.m. on the Friday ending the second official week of the semester.

The health insurance requirement is waived for students who complete waiver forms and provide proof of insurance. The waiver is in effect while the student maintains continuous enrollment at Florida Tech. In case of a change in personal insurance coverage, however, the Office of Auxiliary Services must be notified immediately, and it will be necessary to either provide new proof of insurance or enroll in the Florida Tech insurance plan.

In all cases, full-time students (see page 14 for definition) who fail to submit the required documentation by the dates indicated are automatically billed and enrolled for student health insurance and are obligated for the entire academic year or any portion remaining at the time of registration.

Students seeking to enroll after the open enrollment period must provide documentation of involuntary termination of previous health insurance coverage.

International Students

U.S. government guidelines require health insurance coverage for both full-time and part-time international students, including coverage for all dependents residing with them in the United States.

International students are automatically charged for Florida Tech's student health insurance unless they are officially sponsored by their home government or agency that guarantees student health insurance coverage as part of their contract with Florida Tech. Students in this category are not required to purchase Florida Tech's coverage. It is mandatory for all other international students to be covered by Florida Tech's health insurance plan.

Enrolling for Dependent Coverage

Full-time domestic and all international students who are married, or single parents who have one or more children living with them, may purchase health insurance for these dependents by completing the appropriate form in the Office of Auxiliary Services and paying for the additional insurance at the student accounting office in the controller's office. Dependents will be seen by a local primary care physician, not at the Holzer Health Center.

The student health insurance fee will be refunded and coverage will be canceled if the student pays for coverage and subsequently does not enroll or withdraws from the university within the first two weeks of classes.

Campus Standards, Behavior and University Discipline

A comprehensive system of rules, regulations, and campus code of conduct is published each year by the Office of the Dean of Students. Students are expected to familiarize themselves with these policies and to adhere to them.

Students who violate the university code of conduct, the student housing rules and regulations or any other published university regulation are subject to disciplinary action by the university.

Students who are found guilty of serious violations of university policy are subject to dismissal.

Disciplinary matters are the responsibility of the associate dean of students.

Student-Faculty Complaint Resolution Process

Purpose

1. To promote prompt resolution of perceived wrongs and/or injustices that may arise between students and faculty members.
2. To assure that the rights of privacy of all parties are maintained.
3. To develop a higher sense of community among all persons at Florida Tech.

Complaint Resolution Process

1. Occasions may arise in which a student feels that he/she has a legitimate basis for complaint. It is the policy of the university to promptly resolve these complaints. The normal process for resolution of an academic complaint is as follows:
   a. When a student feels that he or she has a complaint, it should be taken by the student directly to the other party(s) involved. Those involved should attempt to resolve the matter informally and without the need to establish a record.
   b. If the student and the other party are unable to resolve the matter, or if for any reason the student does not feel at ease in going to the other party, he or she should go (alone or with friends) to the academic unit head for assistance. Academic unit heads are able to achieve a fair and equitable solution to most problems. If the student would rather not discuss the matter with the

academic unit head, he or she may choose to go to the school or college dean and/or if deemed necessary, to the vice president for academic affairs.

c. If the student is not at ease with these procedures or feels them to be ineffective, he or she may seek the aid of the ombudsman assigned to handle student-faculty complaints. (The ombudsman can be located through the Academic Support Center.)

2. Complaints involving sex discrimination or equal opportunity can be resolved by using the procedures outlined above. However, if the student is not at ease with these procedures or feels them to be ineffective, he or she may seek the aid of the director of human resources, Mr. Gary Meiseles, who is the Title IX Coordinator, at (321) 674-8100.

3. Students can seek help from any of the above persons at any point they choose. Students can also choose to drop the matter at any time.

4. To promote prompt and equitable resolutions of student complaints, complaints should be made as soon after the incident as possible. Every effort should be made by all parties concerned to resolve the grievance within 90 days.

Definitions

1. The ombudsman is a faculty member appointed by the vice president for academic affairs to investigate reported complaints, to report findings and to help achieve equitable settlements.

2. The Title IX Coordinator is a person designated by the university to ensure that the university is in compliance with federal laws regarding the resolution of sex discrimination allegations. This individual has the added responsibility of ensuring compliance with all federal laws regarding equal opportunity.

Veterans Benefits

Veterans benefits are administered by the Office of Veterans Affairs, located in the Office of the Registrar. Veterans and their dependents eligible to receive VA educational benefits should contact this office after completing admission requirements. Benefits must be renewed each semester during the registration period with this office. Graduate students must submit a graduate program plan to this office prior to the completion of 12 credit hours. Any change to the graduate program plan must be immediately reported to this office. Failure to do so may result in a temporary interruption of VA benefits. Enrollment certification will not be submitted to the U.S. Department of Veterans Affairs (DVA) beyond 12 hours without an approved program plan.

For the purpose of certification of students receiving VA benefits, the following credit hour standards are used:

STATUS	UNDERGRADUATE	GRADUATE
Full time	12	9
3/4 time	9–11	6–8
1/2 time	6–8	5
More than 1/4 time, less then 1/2 time	4–5	3–4
1/4 time or less	1–3	1–2

Students receiving VA benefits are required to make satisfactory progress in their degree programs. Undergraduate students receiving VA benefits are expected to maintain a cumulative grade point average of 2.0 or higher. The first term the cumulative grade point average falls below 2.0, the student is placed in a warning status; a second term places the student in probationary status. A third term below 2.0 results in termination of veterans education benefits. Failure of a graduate student to maintain the minimum cumulative grade point average specified below will also result in termination of VA benefits.

SEMESTER HOURS COMPLETED	MINIMUM CUMULATIVE GPA
9–17	2.50
18–23	2.70
24–32	2.90
33 or more	3.00

After termination, an appeal may be made to the DVA for resumption of benefits. Based in part on the university's recommendation, the DVA will determine whether or not to resume the payment of education benefits to the student.

Academic Information

Registration

Students must be properly registered and have their tuition and fees validated for all courses they are attending. No student shall be permitted to attend a class without processing a registration form, regardless of whether that class is being taken for credit, audit or continuing education units (CEUs).

Registration By Web

The Panther Access Web for Students (PAWS) system enables enrolled students at Florida Tech to use the Internet to register for classes, make schedule changes, and access and print their academic and personal information. Students may view and print course descriptions, semester class schedule, address and telephone information, all grades to date and financial account summary by term. The PAWS Welcome Page may be accessed from the Florida Tech homepage at www.fit.edu or directly at https://paws.adm.fit.edu/homepage.htm. Obtaining access to student-specific information on PAWS requires a student ID number and six-digit personal identification number (PIN) that is assigned by the Office of the Registrar.

Definition of Full Time/Part Time

An undergraduate student is considered full time if he or she is enrolled for 12 or more credits; one-half time for six to 11 credits; less than one-half time for one to five credits. A graduate student is considered full time when enrolled for nine or more credits, half time with five to eight credits and less than half time with one to four credits.

Faculty Adviser System

Each student is assigned a faculty adviser in his or her major academic unit at the beginning of the first semester of attendance. The adviser monitors the student's academic progress toward a degree. A conference is held with each student prior to registration to ensure that courses are scheduled in proper succession, that all relevant academic policies are adhered to and that the schedule best serves the academic needs of the student. Once arranged, scheduled courses cannot be changed without the adviser's written permission, except for changes between sections of the same course prior to the end of the first week of class. The faculty adviser

is available throughout the academic year for consultation by appointment, and students are strongly encouraged to seek the counsel of their faculty advisers in other matters beyond registration and schedule changes.

Transcripts

All courses taken at Florida Tech are indicated in chronological order on the student's academic transcript. A request for a transcript must be made in writing to the Office of the Registrar, Records Unit, along with the appropriate fee enclosed.

Course Numbers Defined

A Florida Tech course number consists of three letters followed by a four-digit number. Numbers beginning with 1, 2, 3 and 4 indicate undergraduate courses, and those beginning with 5 and 6 indicate graduate courses. Graduate students may take 3000- and 4000-level courses, subject to limitations and restrictions delineated in the *Graduate Policy Manual*. Courses numbered 5000–5999 are intended for master's and doctoral students. Courses numbered 6000 and up may be taken only by students enrolled in graduate degree programs.

Credit Hours Defined

The credit-hour value of each course normally represents the number of hours in lecture per week during a full-length semester. Because there are exceptions to this general rule, particularly for laboratory periods, the *Course Descriptions* section of this catalog should be consulted for the credit value of specific courses.

Course Cancellation/Schedule Changes

The university reserves the right to cancel classes for which there is insufficient enrollment, to close a class when the enrollment limit in that class is reached and to make schedule changes as necessary, including changes in time, days, credit or instructor. The university does take the needs of students into account and schedule changes are made only when unavoidable.

Directed Study

Directed study is a means of allowing a student to register for a course during a semester when it is not included in the *Schedule of Classes*. To enroll in a directed-study course, a Request for Directed Study Course form should be initiated and approved according to form instructions. Approval is at the discretion of the academic unit head or program chair responsible for the course, and normally requires evidence of a compelling need by the student. The student should submit the approved form to the Registration Center during normal registration hours. The tuition rate for a directed-study course is the standard undergraduate or graduate rate, plus an additional directed-study fee.

Audit

A student may audit a course with the permission of his or her adviser and payment of an audit fee. An auditor does not receive a grade; an AU is recorded on the transcript in place of the grade if the auditor has, in general, maintained a satisfactory course attendance (usually 75 percent class attendance) and completed the appropriate assignments. If the student does not meet requirements, a final grade of F may be awarded. No changes in registration from credit to audit or from audit to credit will be permitted after the second week of classes.

Request to Study at Another Institution

With special permission, a student who has matriculated at Florida Tech may take a course at another institution and have it apply to his or her degree program. A copy of the policy establishing the conditions and limitations that apply to taking a course at another institution may be obtained from the Office of the Registrar. A Request to Study at Another Institution form must be signed by the student and faculty adviser, and submitted with any other requisite approvals to the Office of the Registrar prior to taking the course(s). A minimum grade of C or above must be earned for transfer into a bachelor's program and B or above is necessary for transfer into a graduate program.

Grade Point Average (GPA)

A student's academic standing is expressed by the cumulative grade point average, determined by dividing the total number of grade points earned at Florida Tech by the total number of credit hours attempted. The number of grade points for each course is the product of the credit hours for the course and 4 for A, 3 for B, 2 for C, 1 for D, or 0 for F. Plus and minus grades (e.g., B+) are not used at Florida Tech. The GPA is truncated at three digits. In the case of multiple degrees earned as either an undergraduate or graduate student, the transcript reports both an overall GPA for all courses taken and program GPAs based on courses that apply to each degree.

Undergraduate and graduate GPAs are never combined. An undergraduate student who takes a graduate course and wishes it to be included on his or her undergraduate transcript must submit a written request to the Office of the Registrar. Once the graduate course has been included on the undergraduate transcript it cannot be used toward fulfillment of the requirements of any graduate degree.

Notification of Grades

At the end of each semester, the Office of the Registrar notifies enrolled students by mail of grades earned. These grades become a part of the official student permanent record and are not subject to change, except on authorization from the instructor, academic unit head and respective dean. The university does not release grades prior to mailing the grade reports, and grades are not released over the telephone.

During the eighth week of classes, students not making satisfactory progress in 1000-level courses are notified of their status by mail.

Petition for Graduation

A student planning to receive any degree must file a Petition for Graduation no later than the date shown in the *Academic Calendar* of this catalog. Students filing petitions after the due date are subject to a late fee and may not be able to graduate as planned because of insufficient time to verify completion of requirements. Petitions may be obtained from the Office of the Registrar or from the respective academic unit. A petition for graduation must be accompanied by a degree plan signed by the academic unit.

Drop/Withdrawal Policy

To add or drop a course, or withdraw from the university, a student must complete a Change in Registration/Status form. Students withdrawing from the university are asked to complete an exit interview in the Academic Support Center.

Failure to attend classes or verbal notification to instructors does not constitute an official drop or withdrawal. Students who drop or withdraw without filing the proper form will receive a failing grade of F. When a student drops a course during the first two weeks of class (except in a summer term) the course will not appear on the permanent academic record. After this date, a W will appear on the permanent record for each dropped course. The W is not used in the computation of the semester and cumulative grade point average. The last day to drop a course without receiving a failing grade is published in the *Academic Calendar*.

Readmission Policy

A student who has been away from the university for four or more consecutive semesters (excluding summer terms) or who has attended another institution during an absence from the university must apply for readmission. If readmission is approved, the degree requirements in place at the time of readmission, or later with academic approval, must be met. A student is not considered absent from the university during a period of study at another institution if a Request to Study at Another Institution was submitted and approved prior to enrollment for the other institution's courses. A student who has been away from the campus for less than four semesters and who has not attended any other college or university may register for class without filing an application for readmission.

Appeal procedures for students who have been academically dismissed and seek reinstatement are described on page 27 for undergraduate students and on page 36 for graduate students.

Incomplete Work

An I is given when a course cannot be completed because of circumstances beyond the student's control. The I indicates the course work is qualitatively satisfactory and there is a reasonable expectancy that completion of the remaining work would result in a passing grade. The instructor must provide a statement of the work to be completed to the head of the academic unit. The student must complete the work at the earliest possible time but prior to the beginning of the seventh week of the following semester, unless an earlier deadline is established at the time the I is recorded and the student is notified of this fact. A waiver of the six-week limitation requires written permission of the cognizant dean. The I will automatically become an F in the seventh week unless an approved waiver has been filed with the Office of the Registrar.

Continuing Education

Continuing Education Units

A continuing education student is defined as one who is not seeking a degree from Florida Institute of Technology. Continuing education students will customarily enroll for courses on the basis of receiving continuing education units (CEUs) rather than graduate or undergraduate credit. The CEU is a nationally recognized unit that indicates successful participation in a qualified program of continuing education. It is defined as 10 contact hours of participation in an organized educational experience under responsible sponsorship, capable direction and qualified instruction.

Students enrolled for CEUs in courses that are being offered for academic credit are required to do all homework, outside reading assignments, term papers or special assignments and to attend at least 90 percent of the class sessions, but they are not required to take midterm or final examinations.

In some situations, the continuing education student may want or need to receive credit rather than CEUs, and this alternative is allowable. Students enrolled for credit, whether degree-seeking or not, must take all examinations in addition to completing all course assignments. Students may switch from CEU to credit or vice versa, any time prior to the end of the first week of classes.

Enrollment Restrictions

A continuing education student may not enroll in any course, either for credit or for CEUs, without the written approval of the head of the academic unit offering the course. This approval will be based on a review of the student's previous preparation and qualifications and an assessment that the student is capable of completing all course assignments (homework, reading, term papers, etc.) and may take into consideration the effect of enrollment of continuing education students on the course and/or academic program. Such approval will be sought and given on a course-by-course basis, and may be withheld at the academic unit head's discretion.

Admission to Degree Programs

A continuing education student may seek admission to a degree program through the normal admission process. If a continuing education student subsequently decides to pursue either an undergraduate or graduate degree at Florida Tech and is accepted into that degree program, a maximum of 12 semester credit hours earned as a CE student may be applied toward the degree, provided the course work is academically appropriate.

English As A Second Language

To enhance the academic performance of students whose native language is not English, courses in English as a Second Language are offered through the Division of Languages and Linguistics. Students with institutional TOEFL scores below 450 on the paper test or 133 on the computer-based test (CBT) will be enrolled in the ELS Language Center on campus. All Florida Tech students must demonstrate English proficiency. A description of the English proficiency required and program offered is given in the *Nondegree Programs* "Languages and Linguistics" section of this catalog.

Release of Student Information

The Family Educational Rights and Privacy Act of 1974 (FERPA) as Amended establishes a set of regulations governing access to and the release of personal and academic information contained in student education records. FERPA applies to the education records of persons who are or have been in attendance in postsecondary institutions, including students in cooperative or correspondence study

programs. FERPA does not apply to records of applicants for admission who have been denied acceptance or, if accepted, do not attend an institution.

Education records are all records that contain information directly related to a student and are maintained by an educational agency or institution, or a party acting for the institution. Exceptions to education records include sole possession records, law enforcement unit records, employment records, health records and alumni records. Rights under FERPA are not given to students enrolled in one component of an institution who seek to be admitted in another component of the institution.

Under FERPA, the rights accorded to parents transfer to students who have reached the age of 18 or who attend a postsecondary institution. These rights are:

1. The right to inspect and review their 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 unit 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 made.

2. The right to request amendment of the student's education records the student believes are inaccurate or misleading. A student should write the university official responsible for the record, clearly identify the part of the record they want changed and why it is felt to be inaccurate or misleading.

   FERPA was not intended to provide a process to be used to question substantive judgments that are correctly recorded. The rights of challenge are not intended to allow students to contest, for example, a grade in a course because they felt a higher grade should have been assigned.

   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 educational records, except to the extent that FERPA authorizes disclosure without consent. 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 (such as an attorney, auditor or collection agent); to officials of another school, upon request, in which a student seeks or intends to enroll; 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 a 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.

   Disclosure is defined as permitting access to or the release, transfer or other communication of the educational records of a student or the personally identifiable information contained therein to any party orally, in writing, by electronic means or by any other means. Disclosure of confidential information to a school official having a legitimate educational interest does not constitute authorization to share that information with a third party without the student's written permission.

   FERPA allows release of the following directory information to the public without student consent: student's name, address, telephone number, date and place of birth, major field(s) of study, E-mail address, participation in officially recognized activities and sports, weight and height of athletic team members, dates of attendance, degrees and awards/honors received and the most recent educational institution attended other than Florida Tech.

   Students may prevent the release of directory information by completing a Request to Prevent Disclosure of Directory Information form available in the Office of the Registrar. By law, however, a student cannot prevent the release of directory information to the U.S. military for recruiting purposes.

   Student consent is required for the release of personally identifiable information such as semester grades, academic record, current academic standing, class schedules, and social security/student number. Student consent is not legally required for disclosure of this information, and reports of alcohol or drug policy violations by students under the age of 21, to certain government agencies/officials, sponsoring agencies, parents/guardians of dependent students and to selected university personnel determined to have a legitimate educational interest in such records.

   Students may consent to release personally identifiable information to others by completing the Authorization for Release of Student Information form available in the registrar's office.

   Information about the provisions of the Family Educational Rights and Privacy Act of 1974 as Amended, and the full text of the law, may be obtained from the registrar's office.

4. The right to file a complaint with the U.S. Department of Education concerning alleged failures by Florida Tech to comply with the requirements of FERPA. The name and address of the office that administers FERPA is
   Family Compliance Office
   U.S. Department of Education
   400 Maryland Ave., SW
   Washington, D.C. 20202-4605

The Solomon Amendment established guidelines for the release of directory information to the United States military for recruiting purposes. This Congressional act allows release of the following directory information without student consent to military recruiters for present and previously enrolled students at least 17 years of age: student name, address, date and place of birth, telephone number, level of education, major field(s) of study, degrees received and the educational institution in which the student was most recently enrolled.

Student Right to Know

Florida Institute of Technology is in compliance with both the Student Right to Know Act of 1990 and the Campus Awareness and Campus Security Act of 1990.

Data in compliance with the Student Right to Know Act can be found in the university's *Student Handbook*. The Office of Campus Security keeps statistics on compliance with the Campus Awareness and Campus Security Act. These statistics can be found on the university Web site, and are published and distributed to the university community on an annual basis. They are also available upon request to other interested parties.

Undergraduate Information and Regulations

New Student Information

Admission

Requirements For Freshman Admission

The admission office carefully reviews all candidates for admission, using several criteria to evaluate a student's ability to complete several years of rigorous study. Applications are reviewed with reference to specific degree programs or for admission to first-year programs in engineering, science and general studies. The criteria considered include, but are not limited to,

- High school curriculum
- Performance in high school coursework
- Class standing (rank in class)
- SAT-I or ACT results
- Teacher recommendations
- Experiential essay
- Participation in special classes, clubs or teams that involve research projects/opportunities and advanced problem-solving techniques

Although an admission interview is not required, campus visits and interviews with admission counselors are highly recommended.

Admission Guidelines

Applicants must demonstrate readiness to succeed in a challenging curriculum. The high school transcript is the most important element of the application. While no minimum grade point average, class rank or standardized test score is specified, these measures must indicate a readiness for college studies in a chosen academic program. Similarly, the courses taken in high school should be commensurate with the degree program to be followed. Science and engineering applicants, in particular, should take the most rigorous and advanced science and mathematics courses that their high schools offer. For all applicants, the nature and estimated difficulty of the courses selected in high school will be an important factor in the selection process as well as the grade point average. An applicant who is a U.S. citizen must have earned a high school diploma or high school equivalency diploma by the date of first enrollment.

International applicants are encouraged to apply, and will be evaluated on the basis of the same criteria as all other students except that SAT or ACT scores are not required.

English language proficiency is not required for admission, but enrollment in academic courses will be limited for all whose native language is not English until proficiency can be demonstrated. The "Languages and Linguistics" section of this catalog describes the ways in which English proficiency may be established, either in advance of enrollment or after arrival at Florida Tech, and presents the courses available to help establish proficiency.

A **home schooled applicant** must submit a transcript of academic work including an assessment of the level attained in mathematics and the sciences, and the texts that were used; a self-descriptive, one-page essay that includes academic, community and athletic accomplishments, career goals and work experience; and SAT I or ACT scores. Although SAT II scores are not required, it is strongly suggested that SAT II results in Mathematics Level II and English Composition be submitted.

An early admission applicant must have completed those high school courses that are indicators of success for the chosen degree program, and must provide a letter from the high school specifying the requirements that must be completed for the high school diploma to be earned. The admission decision will be based on the same criteria as listed above for all other students.

Transfer applicants must provide official transcripts from all colleges and universities previously attended. An applicant who has earned less than 30 semester hours of credit must submit a high school transcript and SAT I or ACT scores.

Transfer Credit

Transfer credit may be awarded for courses taken at a college or university accredited by a regional accrediting association in the United States, or with equivalent recognition in the case of a college or university elsewhere. Flight credit is transferable subject to FAA rules for transferability between schools.

Transfer credit requires a grade of at least C or equivalent and a determination that the work is equivalent to that given at Florida Tech in course content and hours. If the course equivalency is questionable, credit may be granted by written examination. Credits can be transferred without being applicable toward the student's desired degree. Grades and grade points are not transferable. No credit will be given for courses listed on a transcript without a grade, for courses carrying grades but not credit hours, for vocational/technical courses, correspondence courses or experiential learning. In most cases, credit will not be given for courses completed more than 10 years prior to Florida Tech enrollment.

All requests for transfer credit, including credit earned by taking College Board Advanced Placement (AP) examinations, "subject area" College Level Examination Program (CLEP) examinations, etc., must be submitted to the Office of the Registrar. All official transcripts and documents must be submitted prior to the completion of the first semester of enrollment. Requests for additional transfer credit must be made before the end of the second semester. Requests for advanced standing must be submitted to the appropriate academic unit head no later than 45 days after initial registration.

An unofficial transfer credit evaluation is performed by the Office of Admission upon admission, to be followed by the official transfer credit certification after receipt of the tuition deposit. The official certification of transfer credit is performed by the Office of the Registrar, based on evaluations performed by the academic units responsible for the subject matter areas represented by the transfer courses, except for courses for which there is no corresponding Florida Tech program. In the latter case the registrar is the sole approving authority. Official transfer credit is reported on the transcript in terms of equivalent Florida Tech course identifications, if any, and otherwise as electives, either with the subject area identified (e.g., physical science elective) or as undesignated transfer credits. The use of any transfer credit, other than credit for a specific Florida Tech course, in meeting degree requirements is subject to the approval of the faculty responsible for the degree program. Transfer students are advised to provide the registrar with college catalog(s) and/or course syllabi and names of textbooks used in courses to help assure a thorough transfer credit evaluation.

The certification of transfer credit is based on official academic records bearing the correct seals and authorized signatures from former institutions. The Office of the Registrar coordinates the process, certifies courses without respect to the major and provides notice of the official evaluation. The application of transfer credit to the degree program is completed by the student's academic unit. Students may be asked to supply relevant course catalogs, syllabi and course descriptions.

See "Credit by Examination" in this section for information on credit awarded on the basis of equivalency examinations, College Board AP examinations, CLEP subject examinations, International Baccalaureate higher-level examinations, British GCE (A-level) examinations and French Baccalaureate examinations.

Transfer Credit From International Universities

Students requesting transfer credit for academic work completed at an international educational institution must have official transcripts mailed to the Florida Tech admission office directly from all previous institutions attended, showing all courses taken, dates and grades. Personally delivered transcripts are not considered official. Official course descriptions and/or syllabi are also required. In the case of transcripts and course syllabi that are not in English, official English translations are required.

In some cases, additional information about the institution may be required such as accreditation/academic recognition, degrees awarded, academic calendar, grading key and policies, etc.

Florida Tech reserves the right to require the student to request an independent evaluation and/or recommendation regarding the international institution, performed by an agency specified by Florida Tech.

This information must be mailed directly to the Office of the Registrar from the international college/university. Personally delivered transcripts are not considered official.

Articulation Agreements

Articulation agreements exist with a number of schools in the United States and abroad. The majority of these agreements are with two-year colleges and are designed to provide ease of transfer for students who have completed the Associate of Arts degree. Florida Tech has an articulation agreement with all of Florida's community and junior colleges.

For more information on the articulation agreement, contact the articulation officer at Florida Tech.

Special High School or Community College Dual Enrollment

Upon application, Florida Tech may grant "special status" to an outstanding junior or senior enrolled in a high school in Brevard County, or an outstanding community college student from Brevard or Indian River Community Colleges. Enrollment is tuition-free, allowing one class for community college students and up to a maximum of 12 credit hours for high school students. Registration is on a class-by-class space-available basis. Interested students should contact Florida Tech's Office of Admission for application materials and the policy agreement.

Senior Citizens Program

The senior citizens program allows individuals age 65 and over to enroll in courses for credit or audit without charge. Participation in this program is restricted to individuals who are seriously committed to learning.

A prospective student wishing to enroll under the senior citizens program must apply for admission as a nondegree-seeking student and be accepted. The application must be accompanied by records of all prior postsecondary course work. Copies of transcripts are acceptable in lieu of official transcripts. If no previous postsecondary course work was completed, proof of high school graduation is required. These records may be supplemented by a brief statement of "Qualifications Through Life Experience" at the discretion of the applicant. A statement of educational goals and a determination by the appropriate admission office (undergraduate or graduate) that the applicant's educational and life experience history supports a reasonable expectation of successful accomplishment of those goals are necessary.

Enrollment is permitted on a space-available basis only, following the last day of class in the preceding semester or summer term.

Financial Aid and Scholarships

The Office of Student Financial Assistance is available to assist students and their families in identifying sources of aid, completing the application process and providing assistance when needed.

To apply for financial aid, a Free Application for Federal Student Aid (FAFSA) must be submitted annually. The FAFSA is a nationally distributed financial aid form. It is available in

high school guidance offices and most financial aid offices, including Florida Tech's Office of Student Financial Assistance. An electronic version of the form is also available on the Internet at www.fafsa.ed.gov/. Continuing students who filed for the previous year will receive a renewal FAFSA by mail in January of each year.

The need analysis takes into account family income and assets, family size, number in college and numerous other factors. It is a systematic way of measuring a family's ability to pay for educational costs and to determine the student's eligibility for financial assistance.

Financial aid is typically awarded as a package that consists of loans, work, scholarships and grants. Award offers can only be made to students who are accepted for admission to the university. Priority is given to students who file a FAFSA with the federal processor before March 15.

Satisfactory Progress Standards for Financial Aid Recipients

The academic records of all students admitted to Florida Tech for the first time will be considered sufficient to allow them to apply for financial aid. To remain eligible to receive financial aid, continuing students must meet the following Satisfactory Progress Standards instituted by the university in accordance with federal law. A review for compliance with these standards will be conducted at the end of each semester.

Grade Point Average (GPA)—An undergraduate student is expected to achieve and maintain a GPA of 2.0 or higher. This GPA is calculated in accordance with the guidelines contained in this catalog.

Hours completed—Undergraduate students are expected to satisfactorily complete 80 percent of their attempted course work. In general, full-time students should complete at least 12 hours per semester. Part-time students (6 to 11 hours) should complete at least 6 hours per semester. Courses with grades of F, I, AU or W are attempted courses, but are not satisfactorily completed for the semester.

Time limit—An undergraduate student enrolled full time is expected to complete a degree program within 12 semesters, or 180 credit hours attempted. A student enrolled part time is expected to complete a degree program within 24 semesters. For transfer students, these limits include equivalent terms of aid taken at other institutions.

Warning, Probation and Suspension

For Financial Aid Recipients

First-time students who fail to maintain satisfactory progress toward a degree will be placed on financial aid warning and informed of the appeal process relative to satisfactory progress standards. A second infraction will suspend the student's eligibility for financial aid until an appeal is filed and approved. Students can file an appeal based on any factor they consider relevant.

For Scholarship Recipients

Scholarship recipients are required to maintain full-time enrollment (12 semester hours) and a cumulative GPA of 2.8 at the end of each academic year. Failure to maintain the minimum requirements will result in a permanent loss of the academic scholarship.

Grants and Scholarships

Scholarships

Florida Tech offers a variety of scholarships to qualified new students. Scholarship awards range from $5,000 to $12,500 per year, and are limited to eight semesters or the first bachelor's degree, whichever comes first.

All admitted students are considered for scholarships. Normally, an incoming freshman must have high scores on the Scholastic Aptitude Test (SAT I) or the American College Testing (ACT) assessment test and must have a strong grade point average to be considered. Generally, a transfer student must have a strong grade point average.

Grants

Federal Pell Grants—All eligible undergraduate students are encouraged to apply for this federal program by filing the Free Application for Federal Student Aid (FAFSA). This need-based grant ranged up to $4,000 for 2002–2003. All grants depend on the total amount of funds appropriated by Congress for the program. Information and application materials are available through most school guidance counselors and through the university's Office of Student Financial Assistance.

Federal Supplemental Educational Opportunity Grants—Grants through this federal program are available to a limited number of enrolled undergraduate students who demonstrate financial need. Priority is given to students with the greatest need. Annual awards are approximately $1,200.

Florida Tech Grant Assistance Program—This university-funded grant program provides additional assistance in meeting educational expenses. Students must complete and submit the Free Application for Federal Student Aid (FAFSA) to be considered. Annual awards range from $500 to $7,500.

Florida State Aid—Florida residency and eligibility for Florida state aid programs are based on state law and administrative rules. Students who are eligible to be claimed on a parent's income tax return when the parent lives out of state, and independent students whose domicile in the state of Florida is temporary or merely incidental to enrollment in a Florida institution of higher education, are generally not eligible for Florida state aid.

Florida Student Assistance Grants—All U.S. citizens who have been bona fide Florida residents for at least one year and are enrolled or accepted for enrollment as full-time undergraduate students are eligible to apply for aid through this state program. Grants approximate $1,000 per year based on demonstrated need. The student must file a Free Application for Federal Student Aid (FAFSA) each year.

Florida Resident Access Grant—All full-time undergraduate students who meet the Florida residency requirements as defined by the Florida Department of Education are eligible—regardless of family income—to receive financial assistance from the state. This amount varies from year to year based on available funds. Applicants must complete an application and submit proof of Florida residency before October 1 each year. Students are not eligible if all of their tuition is paid by other sources. This award was $2,575 for the 2002–2003 academic year.

Florida Academic Scholars Fund—Qualified entering freshmen who have resided in Florida for one year may receive up to $3,200. To be eligible, a student must have earned a 3.5 cumulative grade point average and scored 1280 or above on the SAT I or 28 or above on the ACT. Applications and further eligibility requirements are available from high school guidance counselors.

Army ROTC Scholarship Program

The U.S. Army offers four-year college scholarships to qualified students. These scholarships pay tuition up to $17,000 per year, textbooks and supplies up to $510 per year, and a tax-free subsistence allowance of up to $2,000 per year. Supplemental scholarships from Florida Tech may also be available. Interested high school students should contact their high school counselors or the nearest Army ROTC office for information about applying for Army ROTC Scholarships. Two- and three-year scholarships are also available for current college freshmen and sophomores. The application deadline is July 15 for the early cycle and November 15 for the regular cycle during the senior year of high school or the preceding summer.

Loans

Federal Perkins Loan Program (formerly National Direct Student Loan Program)—Needy students already enrolled and carrying the normal full-time academic work load are eligible to apply for loans from this federal program. The average award is $1,200/year based on available funding. Repayment of principal and five percent interest typically begins nine months after the completion of study with minimum payments of $40 per month.

Federal Stafford Student Loan—The Stafford loan program is designed to assist students of all income levels with the cost of their education. Stafford loans are either subsidized or unsubsidized. A subsidized loan is awarded on the basis of financial need. The federal government pays the interest on a subsidized Stafford loan until repayment begins and during authorized deferment periods.

An unsubsidized loan is not awarded on the basis of financial need. Interest begins to accrue from the date of disbursement. Students may choose to pay the interest while in school or have the interest capitalized at the beginning of repayment. Students may receive a subsidized and unsubsidized Stafford loan for the same period.

Dependent undergraduates may borrow up to
- $2,625 as a first-year student
- $3,500 as a second-year student
- $5,500 after two years of study (60 earned credit hours)

Independent undergraduates or dependent students whose parents are unable to get a PLUS Loan may borrow up to
- $6,625 as a first-year student (at least $4,000 of this amount must be in unsubsidized loans)
- $7,500 as a second-year student (at least $4,000 of this amount must be in unsubsidized loans)
- $10,500 after two years (at least $5,000 of this amount must be in unsubsidized loans)

Federal Parents Loan for Undergraduate Students—Parents may borrow through this federally insured loan program. A parent may borrow up to the cost of attendance (less financial aid) per academic year on behalf of each dependent undergraduate student. Repayment normally begins within 60 days following receipt of the loan check. The interest rate is variable, capped at nine percent. The minimum payment amount is $50 per month; the total loan must be repaid within 10 years.

Four-Year Guarantee

A four-year guarantee is offered to the incoming freshman class. Florida Tech guarantees that a student who meets the following requirements will earn a bachelor's degree in four years:
- Declare a major as an incoming freshman and continue in that major until graduation;*
- Consult the designated academic adviser before registering each semester;
- Follow the curriculum plan presented in the entry-year *University Catalog* by taking and passing each course in the semester indicated; and
- Maintain a GPA of 2.0 or higher.

**Students needing prerequisite course work and those initially enrolled in nondegree-granting programs (General Engineering, General Science or General Studies) do not qualify for this guarantee.*

Academic Information

Grading and Honors

Undergraduate Grading System

GRADE	EQUIVALENT	RANGE	QUALITY POINTS
A	excellent	90–100	4
B	good	80–89	3
C	average	70–79	2
D	poor	60–69	1
F	failure	0–59	0
I	incomplete course work		
AU	audit–no grade		
P	pass, no effect on GPA		
W	official withdrawal		

Distinguished Student Scholars

Following each fall semester, undergraduate students who have cumulative grade point averages of 3.8 or higher and have completed more than 52 credits at Florida Tech are recipients of Distinguished Student Scholar recognition.

Dean's List

Students who have completed 12 or more credit hours at Florida Tech, including six or more in the semester just completed, with a cumulative GPA of at least 3.0 and a GPA in the semester just completed of at least 3.25, are considered to be "Dean's List" students for that semester. A congratulatory letter from the student's dean confirming this designation will be provided upon request to the dean's office.

Graduation Requirements

To receive a bachelor's degree, a cumulative Florida Tech grade point average of 2.0 or higher is required. In the case of a student seeking two or more bachelor degrees, as defined under "Dual Majors and Additional Degrees" (see page 26), a program GPA of at least 2.0 is required in each program for which a degree is awarded, as well as the overall GPA of at least 2.0 that is required for the award of any bachelor's degree. (See page 15 for the definition of program and overall GPA.) A student is not permitted to graduate unless all financial obligations have been satisfied. All program requirements must be completed no later than 24 hours before commencement exercises. Program requirements completed after this deadline will cause the degree to be awarded at commencement exercises the following semester. When program requirements have been met, the student may request from the Office of the Registrar a letter verifying that all degree requirements have been met and that the degree will be awarded at the next commencement.

Undergraduate Core Requirements

A common purpose of all undergraduate programs at Florida Tech is to impart an understanding of our current technology-centered civilization and its historical background. All students seeking a bachelor's degree are therefore required to complete the following core requirements:

Communication	9 semester hours, including COM 1101, COM 1102
Humanities	9 semester hours, including HUM 2051, HUM 2052*
Mathematics	6 semester hours
Physical and/or Life Sciences	6 semester hours
Social Sciences	3 semester hours

**Science Education majors substitute HUM 3332 for HUM 2052.*

In addition to these 33 semester hours, there is a computer literacy requirement that can be met by earning credit for one of the courses designated as CL in the *Course Descriptions* section of this catalog.

The core requirements for the associate's degree in the School of Aeronautics are the same as for the bachelor's degree, except that in the areas of communication and humanities only the four listed courses (12 semester hours) are included.

Residency Requirements for Graduation

To qualify for a bachelor's degree from the university, no less than 34 semester hours of work must be completed at Florida Tech, and must include the final 12 semester hours before graduation. A request for waiver of the requirement for the final 12 credits to be taken in residence must be submitted, in advance, to the associate vice president for academic affairs for consideration. The 34-credit residency requirement cannot be waived.

The university reserves the right to change requirements for graduation when it is decided that such changes are necessary. Students are generally graduated according to the degree requirements of their peer group in effect at the time of their admission, unless attendance has not been continuous.

ROTC Credits Used for Graduation

A Florida Tech student who has been admitted to the ROTC program may elect to use one or more military science courses to partially fulfill requirements for graduation in the program in which the student is enrolled. The number of credit hours that can be substituted for other courses in a degree program depends on the particular program. These limitations are delineated in the Nondegree Programs "Military Science" section of this catalog. All military science grades are included in the student's semester and cumulative grade point averages.

Cooperative Education Credits

Students participating in the university's cooperative education program (CWE 1001, CWE 2001, CWE 3001 and CWE 4001) receive free elective credits and are considered to be full-time students. The applicability of these credits toward degree requirements is limited, and is dependent on the degree being sought and the nature of the work experience.

Graduation Honors

At graduation, bachelor's degree recipients achieving high academic performance are recognized according to their cumulative grade point averages. In the case of multiple bachelor's degree recipients (multiple diplomas) the honors must be earned separately for each degree received, and are determined by the program GPA based on courses that apply to the specific degree. The honors are determined as follows:

Highest Honor	3.80 to 4.00
High Honor	3.50 to 3.79
Honor	3.00 to 3.49

In computing the cumulative GPA for graduation honors, the forgiveness policy does not apply. Academic honors are listed on the student's diploma and transcript.

Credit by Examination

Placement Examinations

Placement examinations are administered by the Academic Support Center to new freshmen during the orientation period each semester. Academic credit can be earned on the basis of these tests if the result is placement into a more advanced course than an entry level course in the same field, as designated in the student's published program.

There are three mathematics examinations given for specific majors. The Calculus Readiness Test is required of all students whose major requires Calculus 1 (MTH 1001). The Applied Calculus Readiness Test is required of all students whose major requires Applied Calculus (MTH 1702). The Aeronautics Placement Examination is required for majors in the School of Aeronautics unless the major requires calculus. These examinations determine readiness for the mathematics courses required in the student's degree program, and can result in the award of advanced standing credit for MTH 1000 or MTH 1701 in programs that require these courses. A low score necessitates the student taking one or more preparatory courses before enrolling in the first mathematics courses listed as part of the program. A very high score can result in an invitation for further testing to determine if additional credit is warranted.

The communication examination is required for new freshmen and transfer students who lack prior college credit in English, other than English as a Second Language credit.

Many students entering Florida Tech are sufficiently proficient to qualify for advanced placement above the entrance level in chemistry, physics, computer programming and other subjects. A qualified student should contact the academic program, faculty adviser or the Office of Academic Support Services to discuss advanced placement tests in these areas.

Equivalency Examinations

These examinations are administered by academic departments to allow an undergraduate student to demonstrate proficiency in courses offered at the university. They are used with new students to evaluate advanced standing and to reconcile issues involving transfer credits.

Specific limitations apply to equivalency examinations:

1. Students may not take an Equivalency Examination for any course
   a. for which they have been evaluated by a prior placement or equivalency examination;
   b. that is a prerequisite or a deficiency for a course for which they have received credit;*
   c. in which they have received a grade, including a W (withdrawal) or AU (audit);
   d. in which they are currently enrolled beyond the first week of classes; or
   e. that is a prerequisite for a course in which they are enrolled after the first week of classes for that course.*
2. Students may not take an equivalency examination for any course during the semester in which they have petitioned to graduate.
3. Equivalency examinations are not available for some courses. A list of excluded courses, approved by the vice president for academic affairs, is available in each academic unit office. All humanities elective courses are excluded.
4. Equivalency examinations are not available for graduate-level courses, even if the purpose would be to apply the credit toward a bachelor's degree, nor are equivalency credits earned for an undergraduate course applicable toward a graduate degree.

**An exception will be made for a transfer student during the first semester at Florida Tech following the semester in which the student has been officially notified of transfer-credit evaluation.*

Advanced Placement Program (AP)

Credit is awarded for the College Board Advanced Placement Program (AP) examinations on which a student scores 4 or higher, as detailed below:

SUBJECT	SCORE	CREDIT
Science		
Biology	4	BIO 1010 (4)
	5	BIO 1010 (4) and BIO 1020 (4)
Chemistry	4,5	CHM 1101 (4)
Physics B	4,5	Freshman Science Elective (6)
Physics C-Mech.	4,5	PHY 1001 (4)
Physics C-E/M	4,5	PHY 2002 (4)
Mathematics and Computer Science		
Calculus AB	4,5	MTH 1001 (4)
Calculus BC	4,5	MTH 1001 (4) and MTH 1002 (4)
Computer Sci. AB	4	CSE 1502 (3)
	5	CSE 1001 (4) and CSE 2050 (3)
Statistics	4,5	BUS 2703 (3)
English		
Language and Comp.	4,5	COM 1101 (3)
Literature and Comp.	4,5	COM 1102 (3)
Humanities and Social Sciences		
Art History	4,5	Humanities Elective (3)
Macroeconomics	4,5	BUS 2301 (3)
Microeconomics	4,5	BUS 2302 (3)
Psychology	4,5	Social Science Elective (3)
U.S. Gov't. and Politics	4,5	Social Science Elective (3)
Comp. Gov't. and Politics	4,5	Social Science Elective (3)
U.S. History	4,5	Humanities Elective (3)
European History	4,5	Humanities Elective (3)
Languages		
French Language	4	LNG 1101 (3)
	5	LNG 1101 (3) and LNG 1102 (3)
French Literature	4,5	Humanities Elective (3)
German Language	4	LNG 1201 (3)
	5	LNG 1201 (3) and LNG 1202 (3)
Latin/Vergil	4,5	Languages Elective (3)
Latin Literature	4,5	Languages Elective (3)
Spanish Language	4	LNG 1301 (3)
	5	LNG 1301 (3) and LNG 1302 (3)
Spanish Literature	4,5	Humanities Elective (3)

A student receiving a grade of three or better on College Board AP Examinations in most subjects, but not receiving Florida Tech credit under the above provisions, is encouraged to petition to take an equivalency examination, if offered, for further evaluation of possible credit.

College-Level Examination Program (CLEP)

Florida Tech grants academic credit for Subject Examinations only. To receive credit, the minimum score must be above the recommended percentile as published by the American Council on Education. CLEP examinations are not administered on the Florida Tech campus. Contact the Office of the Registrar for further information.

International Examinations

Credit is awarded for participation in an international baccalaureate program based on completion of higher-level exams with grades of four or higher. Credit is also awarded for passing British GCE examinations at the advanced level (A-level) or for passing the French Baccalaureate, based on our review of the subject areas and scores.

Electives

The following definitions of electives pertain to all degree programs at Florida Tech. The student should consult these definitions when selecting appropriate courses to satisfy the electives listed under program requirements. The counsel and consent of the student's adviser is important in the final selection.

Free Elective

Free electives may be any courses taken at Florida Tech, or elsewhere if course-specific transfer credit is awarded by Florida Tech. Non-course-specific transfer credit (credit designated as elective credit) can also be used as free elective credit if approved by the faculty responsible for the student's

degree program. Courses can be combined to satisfy the specified free-elective credits (e.g., three one-credit courses can satisfy a three-credit listing in a degree program) or vice versa (a three-credit course for three one-credit listings). No more than a total of four semester hours of free elective credits earned for physical education and/or health education can be applied toward meeting degree requirements.

Flight Training

Flight training is available to any university student and may be used as elective credit in many degree programs with faculty adviser approval. FAA Private Pilot Certificate training requires only two courses totaling five semester hours of credit.

Liberal Arts Elective

A liberal arts elective is any course offered by the Department of Humanities and Communication (HUM, COM, LNG) or the School of Psychology (PSY). Certain BUS and EDS courses may also be considered liberal arts electives as determined by the student's academic unit.

Humanities Elective

Humanities electives should meet the generally accepted definition that the humanities are the branches of knowledge concerned with human culture. Subjects in this area include art, music, drama, literature, history, philosophy, religion, linguistics, professional ethics and foreign languages other than a student's native language. These courses are designated as humanities (HUM) electives or as humanities/social science (HU/SS) electives in the *Course Descriptions* section of this catalog.

A foreign language is considered the student's native language if it is the formal or commonly used language of the student's country or community, or if it was the language used as the medium of interaction in all or part of the student's pre-university education.

Humanities elective credits may not be granted by equivalency examinations.

Social Science Elective

Social science electives should meet the generally accepted definition that social sciences are the studies of society and of the relationship of the individual to society. Subjects in this area are anthropology, psychology, sociology, economics, political science, history, linguistics, social responsibility and foreign languages other than a student's native language. (See preceding section.) These courses are designated as SS electives or as HU/SS electives in the *Course Descriptions* section of this catalog.

Social science elective credits may not be granted by equivalency examinations.

Restricted Elective

A restricted elective is an elective selected from a specified academic discipline. The academic discipline is included in the specification of the elective, e.g., Restricted Elective (Chemistry) or Restricted Elective (CHM). The level of the elective may be specified by the academic unit.

Technical Elective

A technical elective is a course in any field of science or engineering, subject to department or program approval. Courses classified as mathematics, basic science, applied science, engineering science, engineering design or some combination of these satisfies the requirement. These courses should be at a level appropriate to the level at which they appear in the program.

Engineering Science Elective

Engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward a creative application. These studies provide bridges between mathematics, basic science and engineering practice. Lists of approved engineering science electives are included with the program listings.

Engineering Design Elective

Engineering design is the process of devising a system, component or process to meet desired needs. It is a decision-making process, often iterative, in which the basic sciences, mathematics and engineering sciences are applied to convert resources optimally to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation. Central to the process are the essential and complementary roles of synthesis and analysis. Each engineering design course includes some of the following features: development of student creativity, use of open-ended problems, formulation of design-problem statements and specifications, consideration of alternative solutions, feasibility considerations, detailed system descriptions and a variety of realistic constraints, such as economic factors, safety, reliability, aesthetics, ethics and social impact. A list of approved engineering design electives is normally available in each engineering department office.

Foreign Languages

Students who have had less than two years of a foreign-language study at the secondary level may enroll in elementary language courses at Florida Tech. Students who have had two or more years of a foreign-language study at the secondary level and students who transfer one year of a foreign-language study to Florida Tech from another college or university must enroll in intermediate courses. Native or multilingual speakers of foreign languages may not enroll in elementary or intermediate courses; they may, however, enroll in advanced-level courses. Final decisions regarding the placement of students in foreign-language courses will be made by the head of the department of humanities.

Academic Regulations

The following paragraphs represent an abbreviated presentation of some of the more commonly encountered regulations affecting undergraduate students at Florida Tech. (See also "Academic Information" in this section.) For other academic policies and regulations, the vice president for academic affairs should be consulted. Academic policies are subject to change effective with succeeding catalogs.

Attendance

Students registered for any course are expected to attend all lectures and must attend all laboratories, examinations, quizzes and practical exercises, subject to penalties specified by the instructor for that course.

Students who miss class must obtain permission from the course instructor to make up missed work. This permission must be requested at the earliest possible opportunity and before the absence, if possible. The student must make arrangements with the instructor to make up the missed work. The makeup must be completed within two weeks after the absence. In the case of missed final examinations, the policy on Incompletes (I) applies. In mitigating circumstances, the instructor, with the concurrence of the academic unit head offering the course, may require an alternative to making up the missed work.

If circumstances require a student to report late for a class or to leave before the class is over, prior notification should be given to the instructor if possible. Repeated occurrences may result in the student being temporarily denied admission to the classroom.

The professor of military science of the Army ROTC unit has sole authority to determine attendance regulations in ROTC classes.

Classification

All new students are classified as freshmen unless they have completed sufficient transferable hours at another college or university to qualify for advanced standing at Florida Tech. The university operates on the semester system, and course credits are computed on that basis. For those students who have completed college work elsewhere, classification is based on credit hours accepted at Florida Tech rather than the amount of work presented.

To be classified as a sophomore, a student must have completed at least 30 semester hours; as a junior, at least 56 semester hours; and as a senior, at least 85 semester hours.

Students whose studies at Florida Tech began under the quarter system are classified on the basis of all credits earned under both systems with quarter hours being translated to semester hours according to the ratio three quarter hours to two semester hours.

Course Substitution

Course substitutions or any other deviation from the stated requirements of a degree offered at Florida Tech must have the written approval of the student's academic adviser and the academic unit head.

Dual Majors and Additional Degrees

The dual major is recognized any time a student completes all degree requirements for two of the bachelor's degree programs listed on the inside back cover of this catalog. Upon completion of the requirements for both programs, the student receives one diploma noting both majors (e.g., "Bachelor of Science in Mathematics and Interdisciplinary Science" or "Bachelor of Science in Biological Sciences/ Ecology and Marine Biology Options.") A student who graduates in one program and completes the requirements for a second major in a subsequent term will be issued a new diploma recognizing both fields upon return of the first diploma. In the case of three or more majors, the student must select the two that will appear on the diploma. In all cases, the transcript will list all major fields for which complete degree requirements have been met and for which the student has requested official recognition via a Petition to Graduate.

A student may become a candidate for a second bachelor's degree (two diplomas) when he or she has completed 1) at least 15 credit hours of additional work beyond the requirements of a single degree in the major requiring the higher number of credits and 2) all requirements listed for both degree programs.

Forgiveness Policy

The forgiveness policy is a system by which an undergraduate student may repeat an undergraduate course with only the last grade received for this course (this grade may be an F) used in the cumulative grade point average, and in evaluating the fulfillment of graduation requirements. However, both the last grade and the grade in which the forgiveness policy was applied will be calculated for determining graduation honors. All grades received in any course, including those retaken under the forgiveness policy, are retained and recorded on the transcript. Credits where the forgiveness policy has been applied to a course will be removed from both the term and overall GPAs.

An undergraduate student is allowed to apply forgiveness to undergraduate courses a maximum of five times during his or her Florida Tech career. No forgiveness is allowed for subsequent retakes above the maximum of five; all subsequent grades are averaged into the cumulative grade point average. A student attaining 90 or more credit hours may not apply the forgiveness policy to 1000- and 2000-level courses. The forgiveness policy does not apply to graduate courses, even if taken by an undergraduate student, or to undergraduate courses taken by a graduate student.

A Request to Retake a Course form must be completed for every course retaken under the forgiveness policy. This form is due in the Office of the Registrar no later than Friday of the twelfth week of classes to be applied that semester. This form is a binding agreement between the student and Florida Tech. Once applied to a repeated course, forgiveness cannot be reversed.

Not Permitted to Register

When it is determined by the academic dean of the college or school in which a student is enrolled that a student is deliberately trying to circumvent university academic policy, regardless of scholarship, the dean may determine that such a student is not permitted to register.

Studies-Related Assistance

Student Success Program

The objective of the Student Success Program is to do everything possible to assure that our students are successful in their studies at Florida Tech. A major activity of this program is called FRESH (Freshman Retention by Evaluation and

Systematic Help). FRESH assures that new freshmen are placed at the proper level in first-year courses, especially in mathematics and chemistry.

Research conducted by Florida Tech and by other universities categorizes most student problems as academic or social. With its primary focus on academic concerns, the Student Success Program designs activities to promote the students' academic development. Additionally, it helps enhance student appreciation of the ideas and principles that will sustain lifelong growth in judgment, integrity, emotional maturity and an understanding of people. Current areas of activity in addition to FRESH include:

- Counseling students when they need help with their studies or with campus life as it relates to their studies.
- Assuring that students are informed about the services available to them.
- Sponsoring noncredit seminars, courses for credit and other activities that add depth to students' academic experiences and help them to succeed in their studies and in their careers.
- Referring students to other resources that can provide needed help.
- Acting as a liaison between students and academic units.
- Scheduling and publicizing timely academic advising activities. For example, freshmen academic advisers meet with new freshmen during the sixth week of the new student's first semester to review academic progress and discuss the curriculum.
- Sampling student opinion of both academic and support services offered by the university. Results are transmitted to students and to the university faculty and administration.

Although most of the effort is directed toward the needs of freshmen, a growing portion is aimed at the needs of all students.

Academic Support Center

The Academic Support Center (ASC) is a multipurpose learning facility located in the Evans Library Pavilion. The ASC administers the Student Success Program and offers students free one-on-one tutoring in composition courses, math, computer science, physics, accounting, chemistry, aeronautics and engineering courses. In addition, the ASC offers small group study sessions led by undergraduate honor student tutors.

The ASC also serves as a reserve center for various audiovisual materials that faculty can use to supplement course work. The center contains programs on developmental reading, research paper writing, foreign languages and other topics of value to students.

Change of Major

During their attendance, students receive exposure to a number of different academic subjects. As a result, some students may change their academic goals and wish to change their choice of major field of study. The university permits this change of major, provided the student's new academic unit head approves the student's written request. The new unit head examines the student's past record and decides which courses are acceptable in the new major. Courses unrelated to the new program will not be used in computing the student's cumulative grade point average. However, all earned grades and credits remain on the transcript.

Following a change of major, the degree requirements in the new major may be based on the student's original catalog, or the catalog in effect at the time of the change of major, or on a catalog between those two, as determined by the new academic unit.

Undeclared Major

A new student may be uncertain about the specific academic program he or she wishes to pursue. The undeclared major gives a new student the opportunity to explore the general area of interest more broadly for a limited period of time before choosing a specific major.

Three freshman-year undeclared major programs are available: general engineering, general science and general studies.

The general engineering and general science programs are described in the *College of Engineering* and *College of Science and Liberal Arts* introductory sections, respectively. The general studies program, described in the *Nondegree Programs* section, is for those who may wish to pursue a major in business administration, communication, humanities or psychology.

Academic Probation and Dismissal

An undergraduate student is placed on academic probation at the end of any semester completed with a cumulative grade point average (GPA) less than 2.0, and while on probation is not be permitted to register for more than 15 credit hours without the approval of the cognizant dean. At the end of the probationary semester, the student's academic performance is reviewed, and if the cumulative GPA has increased to 2.0 or greater, the probationary status is removed. If not, the probationary status is continued if the cumulative GPA exceeds the applicable minimum level defined as follows, where the number of credit hours includes transfer credits, credits by examination and all Florida Tech credits taken, whether passed or not, but does not include grades of W:

27 to 59 credit hours ..... at least 1.50
60 to 89 credit hours ..... at least 1.70
90 or more credit hours ..... at least 1.90

A student is academically dismissed at the end of any probationary semester in which the cumulative GPA does not reach the level defined in the preceding paragraph, with the exception of a student who has been reinstated and is meeting all reinstatement conditions.

Students with fewer than 27 credit hours and cumulative GPAs below 1.50 may be academically dismissed by action of the Academic Standing Committee for unsatisfactory progress toward their degrees.

A student who is registered for summer classes prior to the start of the term will not be dismissed for failure to meet these standards but will be reviewed again prior to the beginning of the fall semester. The summer "grace period" is not available to students who are not registered by the Friday immediately following spring semester's final examination week, or to students who fail to meet previous reinstatement conditions.

A student who accumulates four Fs in ESL (English as a Second Language) courses will be academically dismissed.

Dismissal may result from cheating or plagiarism when acted on by the University Disciplinary Committee and approved by a committee consisting of the student's college/school dean, the dean of students and the vice president for academic affairs.

Notification/Right of Appeal

Notification of academic dismissal from the university will be sent to the student by the university registrar.

An academically dismissed student may be reinstated for educationally sound reasons by special action of the Academic Standing Committee of the college or school in which the student is enrolled. A letter requesting reinstatement should be submitted to the committee through the university registrar. A student who has been away from the university for four or more consecutive semesters and was dismissed after the last term of enrollment must submit a letter of appeal for reinstatement. The letter is sent to the Office of Undergraduate Admission along with the application for readmission.

Students reinstated by the Academic Standing Committee may be subject to special requirements as determined by the committee. Failure to meet the conditions specified at the time of reinstatement will result in a second dismissal, with the student retaining the right to request another reinstatement, although such requests are normally granted only in extraordinary cases.

Disciplinary Dismissal

The university reserves the right to dismiss any student at any time if there is just cause and such action has been recommended to the dean of students as outlined in the *Student Handbook*.

Any student dismissed for disciplinary reasons will not be entitled to receive any refunds, will forfeit all fees and deposits and will receive failing grades for all courses scheduled during the semester unless recommended otherwise by the University Disciplinary Committee or designated hearing officer and approved by the dean of students.

Students are expected to be familiar with the "Code of Conduct and University Discipline System" detailed in the *Student Handbook*.

Graduate Information and Regulations

Academic Policies

Academic policies are published in the *Graduate Policy Manual*, which is available for reference and photocopying in the Evans Library, in each academic unit office and in the Office of Graduate Programs. It is also available on the Florida Tech Web site (www.fit.edu), under quick links/ graduate programs. All graduate students are advised to review the manual early in their graduate careers and to refer to it if in doubt about any aspect of graduate policy.

Admission

Admission to graduate study is granted to highly qualified applicants. Successful applicants for the master's degree will have received a bachelor's degree from a regionally accredited institution, or its equivalent internationally, in a program that provides suitable preparation in the applicant's chosen field. Admission to doctoral study is granted to a limited number of applicants. Successful applicants to doctoral study will normally have received both a bachelor's and master's degree, but admission only with a bachelor's degree is possible for superior students. The academic record of the applicant must indicate probable success in the desired program. As a general rule, an undergraduate cumulative grade point average (GPA) of at least 3.0, and for doctoral programs, a cumulative graduate GPA of at least 3.2, is required for admission. Individual academic units may have higher minimum standards. Only in unusual cases, in which clear and substantive evidence justifies such action, will students be admitted who do not meet this standard.

For those cases in which the student has acceptable undergraduate achievement but has course deficiencies, the major academic unit will specify those Florida Tech courses that, if taken, will remove the deficiencies.

English Language Proficiency

English language proficiency is required of all students taking courses at Florida Tech. For students, either domestic or international, whose first language is a language other than English, evidence of English proficiency can either be submitted to the university prior to arrival on campus or demonstrated after arrival. English proficiency is not required for admission or for the issuance of immigration documents. However, any student who is not a native speaker of English, and who enters Florida Tech without first establishing proof of English proficiency, is required to take an institutional TOEFL prior to the start of classes. A score of at least 550 on this test is accepted as proof of English proficiency, and enrollment for classes can then proceed on the same basis as in the case of a native English speaker. Scores between 450 and 550 (CBT 133–213) require enrollment for ESL courses at Florida Tech, as specified by Florida Tech's Division of Languages and Linguistics, with a possibility for concurrent enrollment in a limited number of academic courses depending on the TOEFL score. Students who score below 450 are not permitted to enroll for Florida Tech courses until after having taken a series of lower-level English classes at the ELS center on campus.

See "Languages and Linguistics" in this catalog for information on acceptable proof of English proficiency and on help with English proficiency provided by Florida Tech to students who are not native English speakers.

Procedures

Applicants for master's degree programs should submit their applications at least four to six weeks prior to the beginning of the desired entrance semester. Doctoral program applicants (except for applicants to the School of Psychology and the Department of Biological Sciences) and all international applicants should submit their applications according to the following guidelines:

Fall Semester	April 1
Spring Semester	September 1
Summer Semester	February 1
School of Psychology	
Clinical Psy.D.	January 15
All Others	March 15
Department of Biological Sciences	March 1

Application forms may be obtained by writing to the Office of Graduate Admissions or on the Graduate Admissions homepage at www.fit.edu. In addition to the completed application form, applicants should submit the following:

Application Fee—A nonrefundable application fee must accompany any application. The amount required is shown on the application.

Transcripts—An official certified transcript must be sent to the Office of Graduate Admissions by the registrar of each college or university attended.

The admissions table on the following page outlines the additional required application materials described in the paragraphs below. Applicants should note especially the GRE requirements.

Recommendations*—Individuals who can attest to previous academic and professional performance and to potential for success in graduate study should mail letters of recommendation directly to the Office of Graduate Admissions. At least one letter of recommendation, if required, should be from a full-time faculty member, especially if the applicant is applying to a doctoral program; if a Master's thesis was carried out, a letter from the thesis adviser is normally required.

Summary of Required Admissions Materials

This summary is a quick reference for admission into Florida Tech's graduate program. Please see individual program of study for application and transcript information.

**Abbreviations*

G = GRE General Test (Package 1)
Verbal Reasoning
Analytical Writing
Assessment
Quantitative Reasoning

S = GRE Subject Test

	Letters of Recommendation	Résumé	Statement of Objectives	Examination Scores Required
AEROSPACE ENGINEERING, M.S.				G
Ph.D.	3	✔	✔	G
APPLIED MATHEMATICS, M.S.				
Ph.D.	3	✔	✔	
APPLIED BEHAVIOR ANALYSIS, M.S.	3	✔	✔	G
AVIATION, M.S.	3	✔[3]	✔	G
AVIATION HUMAN FACTORS, M.S.	3	✔[3]	✔	G
BIOLOGICAL SCIENCES, M.S.	3	✔	✔	G
Ph.D.	3	✔	✔	G
BUSINESS ADMINISTRATION, M.B.A.				GMAT
CHEMICAL ENGINEERING, M.S.				
Ph.D.	3	✔	✔	G
CHEMISTRY, M.S.				
Ph.D.	3	✔	✔	
CIVIL ENGINEERING, M.S.	2		✔	
Ph.D.	3	✔	✔	
COMPUTER EDUCATION, M.S.				
COMPUTER ENGINEERING, M.S.				
Ph.D.	3	✔	✔	
COMPUTER INFORMATION SYSTEMS, M.S.				G
COMPUTER SCIENCE, M.S.				G
Ph.D.	3	✔	✔	G, S
ELECTRICAL ENGINEERING, M.S.				
Ph.D.	3	✔	✔	
ENGINEERING MANAGEMENT, M.S.	2	✔	✔	G
ENVIRONMENTAL EDUCATION, M.S.	3	✔	✔	
ENVIRONMENTAL RESOURCES MANAGEMENT, M.S.	3			G
ENVIRONMENTAL SCIENCE, M.S.	3			G
Ph.D.	3	✔	✔	G
INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY, M.S.[2]	3	✔	✔	G
Ph.D.[2]	3	✔	✔	G
MATHEMATICS EDUCATION, M.S.				
Ed.S., Ed.D., Ph.D.	3	✔	✔	
MECHANICAL ENGINEERING, M.S.				G
Ph.D.	3	✔	✔	G
METEOROLOGY, M.S.				G
OCEAN ENGINEERING, M.S.				
Ph.D.	3	✔	✔	
OCEANOGRAPHY, M.S.				
Ph.D.	3	✔	✔	G
OPERATIONS RESEARCH, M.S.				
Ph.D.	3	✔	✔	
PHYSICS, M.S.	3	✔	✔	
Ph.D.	3	✔	✔	G
PSYCHOLOGY, CLINICAL, Psy.D.[1]	3	✔	✔	G, S
SCIENCE EDUCATION, M.S.				
Ed.S., Ed.D., Ph.D.	3	✔	✔	
SOFTWARE ENGINEERING, M.S.				G, S
SPACE SCIENCES, M.S.	3			G, S
Ph.D.	3	✔	✔	G, S
TECHNICAL AND PROFESSIONAL COMMUNICATION, M.S.	2			G

[1] Application and related materials deadline is January 15 for the Psy.D. program. Fall semester enrollment only.

[2] Application deadline for I/O Psychology and Applied Behavior Analysis programs is March 15. Fall semester enrollment only.

[3] Résumés required of students who do not meet standard admission requirements.

NOTE: GRE scores, although required only in certain programs, are recommended in most others and often can result in a favorable admission decision that might not have been possible otherwise.

Résumé*—The résumé should detail all past professional and educational experiences, including such information as publications and memberships in professional organizations. Nontraditional educational experiences, teaching and relevant employment should also be discussed.

Statement of Objectives*—This statement of approximately 300 words should include a discussion of intended graduate study, professional career goals, and past and proposed activities in the field of study.

Graduate Record Examination (GRE)*—The "Summary of Required Admission Materials" table lists those programs that require the GRE. Official scores not more than five years old are required. The table indicates which of the two General Test options the student must select, and whether a subject test is required. The Computer-Based Test (CBT) for the General Test is now the standard form and may be taken year-round at designated sites around the country. International students may still have an opportunity to take the paper-and-pencil test at selected sites. (For a listing of the sites, check the GRE Information and Registration Bulletin available in the Office of Graduate Admissions.) The official test results are mailed within four to six weeks of the examination date. The unofficial test results for the CBT are available immediately after the test. The official results of the CBT are mailed within 10–15 days of the examination date.

Graduate Management Admissions Test (GMAT)*—The GMAT is required of most School of Management applicants; for details see the section on admission requirements for the M.B.A. degree program under *School of Management*.

TOEFL Scores—Any student whose native language is not English may be accepted for any degree program but will be subject to limitations on registration for academic courses until certain English language requirements are met; for details see the "Languages and Linguistics" section in this catalog.

Assistantship Application—Each assistantship applicant must submit a completed assistantship application, three letters of reference and a statement of objectives. Applicants whose first language is not English must submit a score of at least 600 on the institutional TOEFL or 250 on the Computer-based TOEFL (CBT), and a score of at least 45 on the Test of Spoken English (TSE) to be considered for a teaching assistantship. A TOEFL score of at least 550, or CBT score of at least 213, is required for a research assistantship.

Reapplication—Admission to most graduate programs is valid for two years from the semester of acceptance, but for the Psy.D. program and all biological sciences graduate programs admission is only valid for the semester of acceptance. Individuals wishing to begin or resume graduate work after a two-year lapse are required to reapply for admission. Individuals who leave Florida Tech and attend another university must reapply for admission and submit grade transcripts regardless of the length of time since last attending Florida Tech. (See "Readmission Policy" in this catalog.)

Other Forms—The Medical History Report and I-20/IAP-66 request forms should be completed and returned after formal admission to the university has been confirmed.

**See the Summary of Required Application Materials (page 30).*

Check-In

New students may come to the Office of Graduate Admissions in the Keuper Administration Building during regular university business hours for check-in instructions. This office is open during all breaks, except during holidays. Please refer to the Academic Calendar for reporting dates.

Registration Prior to Admission

Under certain circumstances, applicants can avoid delaying their education by registering for courses, for one semester only, while their applications are being processed, provided they are citizens or permanent residents of the United States.

Students who register prior to admission are not eligible to receive federal student financial aid until they are admitted to the university. Such registration requires a preliminary review of written documentation from the degree-granting institution (not necessarily official) showing previous academic courses taken, grades received and degrees awarded. The review should be carried out by the academic unit head or his or her designee. Permission to register pending formal acceptance requires a decision that there is a high probability of eventual acceptance into the program applied for and that registration prior to acceptance is in the best interest of both the academic unit and the student.

In the event that applicants are denied admission while enrolled in graduate courses, they will be given the option of either withdrawing with full tuition refund or completing the courses underway. If the applicant completes one or more graduate courses prior to being denied admission or completes a course for any other reason, he or she will not be given the option of withdrawing or receiving a tuition refund after completing the course.

International Student information

Prospective graduate students from other countries should refer to the "International Student Information" paragraphs in the *Undergraduate Information and Regulations* section of this catalog.

Classification of Students

Assignment to one of the following classifications is made at the time of admission.

Regular Student—A student whose undergraduate grade point average is 3.0 or greater out of a possible 4.0 and who meets all other criteria for admission to a particular program is classified as a regular student.

Provisional Student—A student whose undergraduate grade point average is less than 3.0 out of a possible 4.0 or equivalent, or whose academic unit identifies course deficiencies that are considered excessive, is classified as a provisional student. After completing nine credit hours, a provisional student with a grade point average of 3.0 or greater will be reclassified as a regular graduate student. A provisional student whose grade point average is less than 3.0 is placed on academic probation. A grade of D or F in any academic course taken while in provisional status will result in dismissal. Provisional students cannot be admitted to doctoral programs.

Special Student—Special student classifications exist at both the undergraduate and graduate levels and are used for students who, for various reasons, are not enrolled in degree-seeking programs. Specific instances include:

1. a student taking course work for credit to apply at another institution;
2. a student taking courses to fill specific professional or vocational needs; or
3. a prospective M.S. or M.B.A. student with generally acceptable undergraduate achievements but with subject matter deficiencies (usually as a result of changing fields) that, in the judgment of the academic unit, preclude immediate acceptance into the degree program.

In the last-mentioned case, the student will normally have the option of pursuing an undergraduate degree in the desired discipline or making up the deficiencies while enrolled as a special student. The student will then be considered for admission to the appropriate graduate degree program once sufficient additional work has been done to form an adequate basis for a decision by the academic unit.

The customary classification of special students will be as undergraduate students, regardless of the existence of previous bachelor's degrees. A student may, however, be classified as a special graduate student. In such a case, designation and continuation of graduate student status will be at the discretion of the cognizant academic unit, or the director of graduate programs in the case of students who are not seeking eventual admission to a graduate degree program.

Master's Degree Requirements

Course Requirements

Course requirements are stated in each master's degree program description. The stated minimum credit hours can include any or all of the following, subject to academic unit approval and specific restrictions stated in the *Graduate Policy Manual*:

1. Up to 12 semester hours of credit transferred from a regionally accredited institution or, in some cases, from a foreign university; or, in the case of a partner institution in a joint-degree or dual-degree program with Florida Tech, up to one-half of the total minimum credit hours.
2. Up to six semester hours of credit for 3000- and 4000-level undergraduate courses taken at Florida Tech. Only 4000-level courses will be considered if the courses are in the student's major field of study.
3. Credit previously used to meet the requirements of another master's degree at Florida Tech may be used to meet up to one-half the credits required for the later degree.
4. Credit in excess of the seven-year statute of limitations if a waiver is in effect, in accordance with the statue of limitations section of this catalog.

Academic credit applied toward the requirements of a bachelor's degree, at Florida Tech or elsewhere, may not be used in any graduate program at Florida Tech, regardless of the level of the course.

Program Plan

Each master's-level graduate student is required to have an approved program plan on file no later than one month prior to the time that nine credit hours of graduate courses have been completed.

Only one program plan can be in effect for a student at any given time.

Because of the importance of the program plan in establishing a new program GPA following a change of major, no request to change majors will be processed unless accompanied by an approved new program plan. This requirement applies whether a degree was earned in the first major or not.

Admission to Degree Candidacy

A master's student becomes a degree candidate by satisfying the following requirements:

1. removal of all course deficiencies specified at the time of admission;
2. completion of at least nine semester hours of graduate courses in good standing, as defined by the academic dismissal regulations of the Office of Graduate Programs; and
3. approval of a program plan by the academic unit head.

Thesis

Master's theses are required in some programs and are optional in most others. The credit hours assigned to the thesis vary according to the program. A student cannot initially register for thesis unless his or her GPA is at least 3.0. Subsequent to the initial registration, the student must continue to register for thesis each academic term, including summer, until the thesis is defended and accepted by the Office of Graduate Programs. An interruption in thesis registration requires written approval in advance and is permissible only for educationally sound reasons and only if the student is making no use of university facilities or personnel.

A grade of S (Satisfactory progress) or U (Unsatisfactory) is assigned at the end of each academic term, with zero credit hours earned. In the first term of registration, timely submission and approval of the thesis proposal is required before a grade of S can be assigned. Based on the written thesis proposal and other indications of the candidate's ability to organize and present research plans and results in writing, the academic unit may require a course in thesis preparation, COM 4000. In addition, the candidate should contact the Office of Graduate Programs early in the thesis preparation process for guidance regarding style and format requirements. A *Thesis Manual and Style Guide* is available at the bookstore.

After at least the required number of thesis credits have been registered for and completed with grades of S, all research has been completed and the written thesis prepared, a thesis defense is scheduled. Scheduling the defense is the primary responsibility of the candidate, who needs to take into account faculty schedules, the need for adequate time for a thorough faculty review of the completed thesis and the requirement that the defense be included in the schedule of

graduate examinations that is published each week for examinations taking place the following week. If the thesis defense is successful, a P grade is assigned corresponding to the required number of thesis credit hours. A minimum of five copies of the approved thesis must be accepted by the Office of Graduate Programs before the degree can be awarded.

Design Project

All requirements listed for theses in the preceding section apply equally to design projects.

Final Program Examination

A final program examination is required in all master's programs with the exception of those in the School of Management and School of Extended Graduate Studies for which there is no on-campus counterpart. For nonthesis students, the examination may be either written or oral, or both, at the discretion of the academic unit, and must be taken no earlier than the last full semester (not including summer terms) in which the student is registered for courses. For thesis and design project students, the examination consists primarily of an oral defense of the thesis or design project and takes place during the last term of registration for M.S. Thesis. Questions may be asked that pertain to related subject matter, as well as directly to the thesis itself. Questions requiring a written response may be directed to the candidate in advance of the scheduled oral defense.

An examination candidate must have a grade point average (both program and overall, if different) of 3.0 or higher at the time of the examination to be permitted to schedule any final program examination.

All oral examinations must be included in the weekly schedule of examinations published by the Office of Graduate Programs. For written examinations, application must be made by the student to the academic unit at least one month in advance of the desired examination date. Examination dates will normally be announced each term by academic units requiring written examinations.

A candidate must be enrolled during the term the examination is taken. An exception is made for a nonthesis student if a separate examination fee is paid.

Transfer Credit

If the courses constitute a logical part of the student's master's program, a maximum of 12 semester hours of transfer credit from a regionally accredited institution may be accepted, with the approval of the head of the appropriate academic unit and the director of graduate programs under the following conditions:

1. The courses must have been taken for graduate credit.
2. They must have been graded courses, and grades of at least B or equivalent must have been earned in each course.
3. They must have been taken not more than six years prior to the student's first enrollment at Florida Tech.

No credit is given for courses listed on transcripts without grades, for courses carrying grades but not credit hours, for vocational/technical courses, correspondence courses, experiential learning, or for courses taken at an institution based in the United States that is not accredited by a regional accrediting association.

Transfer credits are not included in the computation of grade point averages.

Doctoral Degree Requirements

Requirements for the Doctor of Philosophy (Ph.D.) and Doctor of Education (Ed.D.) degrees include the general requirements listed here and specific program-by-program requirements and variations as presented in later sections of this catalog. In addition to the Ph.D. and Ed.D. degrees, the university also offers the Doctor of Psychology (Psy.D.) degree, described in the School of Psychology section.

The Ph.D. and Ed.D. degrees are awarded on the basis of clear evidence that the recipient possesses knowledge of a broad field of learning and mastery of a particular area of concentration within that field. The work leading to the degree consists of advanced studies and research that represents a significant contribution to knowledge in the subject area. Each student must complete an approved program of study, pass a comprehensive examination, complete an original research program, and prepare and defend a dissertation on that research.

Credit Hour Requirements—Although the Ph.D. or Ed.D. degree is awarded primarily on the basis of creative accomplishment rather than the accumulation of a specified number of credit hours, minimum standards are enforced regarding the number of credit hours that must be successfully completed by all Ph.D. students. A total of at least 78 semester hours must be completed, including at least 48 semester hours of course work and 24 hours of research and dissertation. The 48 course hours must include at least 24 semester hours of formal classroom courses, and with academic unit approval may include up to six credit hours of undergraduate courses, subject to the limitations delineated in the Graduate Policy Manual. At least 18 of the 48 course hours and all of the 24 research and dissertation credit hours must be taken at Florida Tech. At least 15 credit hours of dissertation must be taken after admission to candidacy. Credit earned for courses taken in fulfillment of the requirements for a master's degree, either at Florida Tech or elsewhere, may be used in meeting the 48-semester-hour minimum requirement for course work, subject to the restrictions stated above and provided that the courses are directly applicable to the field of the Ph.D. degree. A student should expect to take a significant amount of course work at a more advanced level, even if master's degrees in more than one field have been earned.

Doctoral Committee—At least 90 days prior to the comprehensive examination, the student must select a major adviser with the concurrence of the individual selected and the student's academic unit head and dean. The major adviser serves as both research supervisor and chair of the Doctoral Committee and need not be the same person who served as academic adviser while the student was taking courses.

At least 60 days prior to the comprehensive examination, the major adviser nominates a Doctoral Committee for approval by the student's academic unit head and the director of graduate programs. The committee consists of at least four members, including the major adviser. One member must be a full-time graduate faculty member from an academic unit that is administratively different from the student's and major adviser's. At least three members, including the major adviser, must be approved for doctoral advising.

This committee serves in an advisory capacity throughout the remainder of the doctoral program and is responsible for formally evaluating the candidate's progress by conducting the comprehensive examination, reviewing and approving the dissertation proposal, conducting the dissertation defense and approving the dissertation.

Comprehensive Examination—After the completion of all formal course work (as determined by the academic unit) included in the doctoral program of study, the student is required to take a comprehensive examination administered by the Doctoral Committee established for the student. The examination covers the student's major area of emphasis in depth but may also include other areas considered appropriate by the Doctoral Committee. The examination may be written, oral or both, according to the requirements of each doctoral program. To pass, the student must have the unanimous approval of the committee. A student who does not pass the examination may, at the option of a majority of the committee, be allowed one opportunity to retake the examination after a suitable period of study. The examination must be passed at least one calendar year before the degree is awarded.

Dissertation Proposal—Subsequent to successful completion of the comprehensive examination, a dissertation proposal must be submitted to the Doctoral Committee, who will ascertain that the subject of the dissertation is of doctoral quality and that completion of the dissertation is feasible. If the proposal is approved by the committee, a copy will be made a part of the student's permanent record.

Degree Candidacy—After a student has passed the doctoral comprehensive examination and has had the dissertation proposal approved by the Doctoral Committee, the academic unit head will notify the registrar that the student has been admitted to candidacy for the doctoral degree.

Residence—The residence requirement consists of 1) the performance of research under the direct supervision of Florida Tech faculty for at least one calendar year, and 2) enrollment in a Florida Tech graduate program for a minimum of two years from the time of original registration.

A doctoral student who has been admitted to candidacy must normally register each academic term thereafter for six or more credits of dissertation throughout the remainder of his or her program. At the discretion of the academic unit, a doctoral student can register for three credits of dissertation where justified. In some cases, registration for fewer credit hours is permitted in the final semester of registration; see the *Graduate Policy Manual* for details. After admission to doctoral candidacy, an interruption in registration is permissible only if the student is not making any use of university facilities or personnel, and requires prior written approval by the academic unit head and the director of graduate programs.

The student's dissertation performance is evaluated in each term of registration, and grades of S (Satisfactory) or U (Unsatisfactory) are assigned. These grades do not affect the student's grade point average. S grades corresponding to the required number of dissertation hours are replaced by grades of P (Pass) upon successful completion of the dissertation.

Dissertation Preparation and Defense—The dissertation must demonstrate critical judgment, intellectual synthesis, creativity and skills in written communication. The general format must follow the guidelines established by the academic unit and the Office of Graduate Programs. Copies of the dissertation must be submitted to the Doctoral Committee at least one month prior to the proposed date of the dissertation defense. The candidate must verify, by contacting each member of the Doctoral Committee, that the dissertation is generally acceptable before actually scheduling the defense. The Office of Graduate Programs must be notified of the defense at least two weeks prior to its scheduled date.

The dissertation defense is administered by the Doctoral Committee. The candidate is questioned on the subject of the dissertation and any additional topics related to the candidate's ability to organize and conduct research. The dissertation must have the unanimous approval of the committee and must also be approved by the academic unit head. Requirements for the degree are not completed until the dissertation is accepted by the director of graduate programs. A completed Dissertation Microfilming Agreement Form and Survey of Earned Doctorates Form (both available from the Office of Graduate Programs) and an additional title page and abstract must accompany the required dissertation copies.

Academic Unit Requirements—The requirements specified above comprise the minimum requirements for Ph.D. and Ed.D. degrees at Florida Tech. Academic units may specify additional requirements for their doctoral degrees as defined in this catalog.

Grading System and Requirements

Graduate work is evaluated by letter grades, with only grades of A, B, C and P being credited toward graduate degrees. Grades of D and F are failing grades in graduate courses. Failed courses must be repeated at the earliest opportunity, if they are required courses. An elective course in which a D or F is received must be repeated, unless the academic unit approves an additional course to be taken in its place.

When Pass/Fail (P/F) grading is used, the total credit hours earned increases without having any effect on the grade point average (GPA) if a grade of P is earned, whereas no credit hours are earned and the GPA is adversely affected in the case of a grade of F, just as with any other F. Pass/Fail grading is used for certain courses and for master's theses, design projects and doctoral dissertations.

The program GPA is based on the student's program plan and includes all courses shown on the program plan as applying toward the degree, both graduate numbered and undergraduate numbered. Prior to submission of the program plan, the GPA will be based on all graduate-numbered courses taken at Florida Tech with the exception of any that may previously have been used to satisfy the requirements of a bachelor's degree.

In cases where the degree-related GPA referred to above does not include all graduate courses taken at Florida Tech, an overall GPA is also calculated and reported. Graduate courses used to compute the overall GPA, but not the program GPA, include courses taken as deficiencies, courses unrelated to the student's degree program, courses taken prior to a change of major and courses taken in satisfaction of the requirements of a previously earned graduate degree. Courses related to the degree program that are taken in excess of degree requirements are normally included in the program plan. It is not possible to delete a course from a program plan once the course has been taken, although an exception is made if the statute of limitations is exceeded at which time it is dropped from the program plan and from both the program and overall GPAs. Courses are not otherwise dropped from the overall GPA except by special action of the Graduate Council following a change of major. If no degree was earned in the first major and the courses are clearly not applicable to the new major, the council can approve deletion from the overall GPA.

Grades of S (Satisfactory) and U (Unsatisfactory) are used as progress grades in thesis, dissertation, design project, research and internship, and as final grades in some zero-credit seminar courses. They are similar to grades of P and F except that they carry no credit, and S grades (when used as progress grades) may be replaced at any later time by credit-carrying grades of P. U grades remain on the transcript permanently, but like grades of S they do not affect the grade point average.

The basic requirement for receiving any master's degree is a GPA of at least 3.0 on a 4.0 scale where A = 4, B = 3, C = 2, D = 1, F = 0. Both the overall GPA and the applicable program GPA must be 3.0 or greater for a master's degree to be awarded.

For a doctoral student, a 3.2 cumulative program grade point average represents minimal satisfactory academic performance and is required for admission to candidacy and for graduation. In addition, an overall grade point average of at least 3.0 is required, based on all courses taken as a graduate student at Florida Tech.

Statute of Limitations

Master's Degree

A seven-year statute of limitations is in effect on all work applied toward a master's degree at Florida Tech. All course work and thesis research, including thesis/design project acceptance or final program examination, must be completed within a total elapsed time span of not more than seven years.

An academic unit head may approve a waiver of the statute of limitations for up to six semester credit hours of course work taken either at Florida Tech or elsewhere, subject to the following conditions:

1. Any course so approved must have been completed within the previous 10 years, and with a grade of at least B.
2. Only those courses where course content has not changed significantly in the intervening years may be approved.
3. The student must provide evidence of current mastery of the course content.

The academic unit head must notify the registrar in writing of the action.

In the case of a waiver request that does not conform to these requirements, or a request involving more than six semester credit hours, the academic unit head may either deny the request outright or submit it to the academic dean, accompanied by proof of current mastery based on a written examination endorsed by Florida Tech faculty, with a recommendation for a favorable decision.

A waiver is in effect for a period of seven years from the time it is approved.

Courses over the time limit for which the limit has not been waived may be removed, upon written request, from grade point average (GPA) calculations.

Ph.D. and Ed.D. Degrees

The statute of limitations for students pursuing Ph.D. and Ed.D. degrees is five years from the end of the academic semester during which the comprehensive examination is successfully completed. If this period should expire prior to completion of the degree and if the student wishes to continue enrollment in the program, the comprehensive examination must be readministered by the student's Doctoral Committee. This new examination should reflect developments of importance in the area of study occurring since the first examination, as well as areas of general importance.

Doctor of Psychology (Psy.D.) Degrees

A student who has not completed the requirements for the degree within seven years of initial enrollment will no longer be considered a candidate for the degree. Appeals for reinstatement of candidacy status must be directed to the Graduate Council.

Probation and Dismissal

Master's Students

A master's student must continue to demonstrate academic proficiency in course work and must show reasonable progress toward the 3.0 grade point average (GPA) required for graduation. Failure to have the minimum GPA specified below results in written notification of academic probation, including the conditions of probation. Failure to satisfy the conditions of probation will result in dismissal following the probationary semester.

In the case of separate program and overall grade point averages, the current program average must meet the standard for the number of attempted credit hours shown on the current program plan and the overall average must meet the standard for the total credit hours attempted.

SEMESTER HOURS COMPLETED	MINIMUM GPA
9	2.60
15	2.80
18 or more	3.00

Students who have transferred credits from another institution will be permitted to complete nine credits of graduate courses at Florida Tech before evaluation of the GPA. After completing nine credits at Florida Tech, the student must meet the above standards for total semester hours completed (Florida Tech credits, plus transfer credits) by using Florida Tech's GPA.

A master's student with fewer than nine credit hours of graduate courses, but nine or more credit hours of undergraduate courses taken while enrolled as a graduate student at Florida Tech, must maintain a 3.0 average in these undergraduate courses. Failure to maintain this average will result in probation. Failure to meet probation terms will result in academic dismissal. Upon completion of nine credit hours of graduate courses, the graduate GPA will take precedence in probation and dismissal evaluations.

In addition, either of the following conditions will result in immediate academic dismissal:

1. Two or more grades of D or F in any courses taken as a graduate student.
2. Judgment by the Graduate Council that the student is not making satisfactory academic progress, or that the academic efforts of other students are hampered by his or her presence.

In all cases of academic probation and dismissal, the student will be so notified by the Office of Graduate Programs. Any academic dismissal can be appealed for educationally sound reasons. A letter of appeal requesting reinstatement must be submitted to the Office of Graduate Programs. The student will be allowed to continue attending classes pending Graduate Council action on the appeal. If the appeal is denied, or if no appeal is submitted within the time period specified in the dismissal letter, the student's registration will be cancelled and further class attendance will not be permitted.

Doctoral Students

The basic standard for successful performance at the doctoral level is a minimum 3.2 program grade point average and an overall minimum grade point average of 3.0. The program grade point average for a doctoral student includes all courses shown on the program plan as applying toward the doctoral degree, both graduate numbered and undergraduate numbered. The overall grade point average is based on all course work taken at Florida Tech while enrolled as a graduate student.

A program grade point average less than 3.2 after 15 or more semester hours will result in probation; if the grade point average of 3.2 is not attained after completing the probationary semester, the Graduate Council will consider dismissal of the student. A grade point average below 3.0 at any stage of the doctoral program will result in the student's dismissal.

If a student fails to maintain satisfactory progress in course work and/or research, as determined by the graduate faculty of the student's major academic unit, academic dismissal may be recommended regardless of the GPA. In such cases, concurrence of the Graduate Council is required.

A dismissed student has the right to appeal the dismissal by submitting a letter to the Office of Graduate Programs stating the basis for the appeal. All appeals are considered by the Graduate Council.

Dismissal for Misconduct

Student conduct that violates the legal or ethical standards of the university may result in mandatory withdrawal from all classes and denial of permission to register in future terms for either a definite or indefinite period of time.

Examples of academic misconduct that could result in these actions include cheating, plagiarism, knowingly furnishing false information to the university, or forging, altering or misusing university documents or academic credentials.

Examples of research misconduct include fabrication, falsification, plagiarism, misappropriation of ideas of others or failure to comply with legal requirements governing research.

Financial Assistance

Graduate Assistantships and Scholarships

Graduate assistantships involve a stipend or a tuition-waiver, or both, and are awarded to well-qualified master's and doctoral students. Awards are normally made on a year-to-year basis. However, not all students receive assistantships, and partial assistantships (such as tuition waiver only) may also be offered. International students are eligible for graduate assistantships in some academic units. In addition to specific academic unit requirements, any student whose first language is not English, whether or not the student has graduated from an English speaking, post-secondary institution, must submit a score of at least 600 on the Test of English as a Foreign Language (TOEFL) and a score of at least 45 on the Test of Spoken English (TSE) to be considered for a teaching assistantship. A TOEFL score of at least 550 must be submitted for a research assistantship.

Award of a teaching assistantship requires satisfactory completion of the GSA Teaching Seminar, generally offered once each year at the start of the fall semester. There is no fee for enrollment in this one-week seminar, which is open to all graduate students recommended by their academic unit heads, as well as new teaching assistants, who are required to attend.

Teaching assistants are subject to written evaluation by their supervisors. These evaluations are required for reappointment. The assistantship application deadline is February 15 for the fall semester. The application should be directed to the head of the student's academic unit.

The U.S. Army offers college scholarships to qualified students. These scholarships pay tuition up to $16,000 per year, textbooks and supplies up to $510 per year, and a tax-free subsistence allowance of up to $2,000 per year. Two-year scholarships are available for college seniors considering graduate school or current graduate students. Contact the nearest Army ROTC office for more information.

Federal Assistance

As a general rule, a graduate student must be enrolled half time (at least five credit hours per term) as a regular student in a degree program and must be a U.S. citizen or an eligible noncitizen to qualify for federal and/or state financial aid.

The graduate student must also complete a Free Application for Federal Student Aid (FAFSA). These forms are available in the Office of Student Financial Assistance.

Although applications are accepted throughout the year, we encourage graduate students to file prior to March 20 to ensure timely processing.

Students must reapply each year and maintain satisfactory academic progress as defined by the Office of Student Financial Assistance to continue receiving federal assistance.

The Federal Stafford Student Loan program is available to graduate students who apply for federal assistance and who maintain at least halftime (five credit hours) enrollment in graduate-level courses. Stafford loans are either subsidized or unsubsidized. A subsidized loan is awarded on the basis of financial need. The federal government pays the interest on a subsidized Stafford loan until repayment begins and during authorized deferment periods. A student may borrow up to $18,500 each year in Stafford loans. At least $10,000 of this amount must be in an unsubsidized Stafford loan. Cumulatively, a graduate student may borrow up to $138,500 in Stafford loans with no more than $65,000 in subsidized Stafford loans. The graduate debt limits include any Stafford loans received for undergraduate study.

Satisfactory Progress Standards for State and Federal Aid Recipients

The academic records of all students admitted to Florida Tech for the first time shall be considered sufficient to allow them to apply for financial aid. To remain eligible to receive financial aid, continuing students must meet the following Satisfactory Progress Standards instituted by Florida Tech in accordance with federal law. A review for compliance with these standards will be conducted at the end of each semester.

1. Students are expected to achieve and maintain a grade point average (GPA) of 3.0 or higher. This GPA is calculated in accordance with the guidelines contained in this catalog.
2. Graduate students are expected to satisfactorily complete 80 percent of their attempted course work. In general, full-time students should complete at least nine hours per semester, and part-time students at least five hours per semester. Courses with grades of F, I, AU or W are attempted courses, but are not satisfactorily completed for the semester.
3. A master's degree program is expected to be completed within six semesters, or 54 credit hours attempted. Cases will be reviewed on an individual basis when additional time is needed.

College of Engineering

Dean J. Ronald Bailey, Ph.D. , P.E.

Bachelor of Science

Aerospace Engineering
Chemical Engineering
Civil Engineering
Computer Engineering
Computer Sciences
  Computer Science
  Information Systems
Electrical Engineering
Environmental Sciences
  Environmental Science
  Meteorology
Mechanical Engineering
Ocean Engineering
Oceanography
Software Engineering

Master of Science

Aerospace Engineering
Chemical Engineering
Civil Engineering
Computer Engineering
Computer Information Systems
Computer Science
Electrical Engineering
Engineering Management
Environmental Sciences
  Environmental Resource Management
  Environmental Science
  Meteorology
Mechanical Engineering
Ocean Engineering
Oceanography
  Biological
  Chemical
  Coastal Zone Management
  Geological
  Physical
Software Engineering

Doctor of Philosophy

Aerospace Engineering
Chemical Engineering
Civil Engineering
Computer Engineering
Computer Science
Electrical Engineering
Environmental Science
Mechanical Engineering
Ocean Engineering
Oceanography

Associate Dean, Academics
Edward H. Kalajian, Ph.D., P.E.

Associate Dean, Research
Fredric M. Ham, Ph.D.

Director of Laboratories
Daniel R. Simpson, B.S.

Organization

The College of Engineering comprises six departments that administer the engineering and applied science programs listed on this page. The departments are chemical engineering, civil engineering, computer sciences, electrical and computer engineering, marine and environmental systems, and mechanical and aerospace engineering. Engineering management is a free-standing graduate program within the college.

The College of Engineering supports several research centers and laboratories, including the Center for Information Assurance, Research Center for Waste Utilization, Center for Remote Sensing, Wireless Center of Excellence, and Wind and Hurricane Impact Research Laboratory. These centers and laboratories serve to encourage collaborative research activities involving faculty and students from different programs within the college and across colleges.

Mission Statement

The mission of the College of Engineering at Florida Institute of Technology is to pursue knowledge, truth and excellence in a student-centered academic community characterized by shared values, unity of purpose, diversity of opinion, mutual respect and social responsibility. The college is committed to discovering new knowledge through research, and to enhancing Florida Tech's position as an independent educational institution with bachelor's, master's and doctoral degree programs.

Admission

As a Freshman

All entering students are strongly advised to complete at least one year each of chemistry and physics, two years of algebra, one year of geometry and one-half year each of trigonometry and analytic geometry prior to enrolling. In addition, at least one year of high school biology is recommended for students planning to major in environmental sciences or oceanography. Familiarity with computers and computer programming is advisable for students in all fields.

Admission decisions are based primarily on grades received in the courses listed above plus English, high school rank in class, grade point average and SAT or ACT scores.

A test administered to entering freshmen during the week preceding the start of classes is designed to identify deficiencies in mathematics. Special courses are available for students to strengthen their skills before entering their chosen field of study. Tests are also administered at this time to allow advanced placement in chemistry, computer science and mathematics. Students who did not take high school physics are allowed to take PHY 1001, but should be prepared to do extra work to keep up with the course material.

Written and spoken communications are extremely important. Problems with reading comprehension or speed make it difficult for students to successfully complete reading assignments and tests. Ability to state complex ideas and technical results clearly, in correct written English, can greatly reduce the difficulty of laboratory courses requiring written reports. Every effort should be made to correct any weaknesses in these areas prior to arrival at the university or during the freshman year.

As a Transfer Student

Admission decisions for transfer students are made on the basis of a combination of the requirements used for new freshmen, postsecondary grade point averages and specific course grades applicable to the major. Where courses equivalent to at least the first year of the university major have been completed, the level of accomplishment in these courses determines admission.

Students who attend a community college for two years before transferring into the College of Engineering should comply with articulation agreements where they exist and refer to the list of "Recommended Courses to be Transferred." This list is for general guidance only. The detailed curriculum plan for the desired program should be consulted for more specific guidance. If possible, the prospective student should review his/her community college curriculum periodically with an appropriate university faculty member. Some of the courses normally taken during the first two years of a program could be unavailable at some community colleges. As a result, it may take one or more semesters beyond the nominal two years following community college graduation to complete a specific bachelor's degree program.

Most mathematics, physics, applied mechanics, computer programming and English courses at the first- and second-year levels are offered every semester. Every effort is made to make space for new transfer students. A transfer student can usually be registered for a full schedule of courses that are tailored to his or her immediate academic needs. Exceptions, when they occur, are usually the result of the student having completed all course work in some disciplines, such as mathematics and the humanities, without having started course work in other essential areas, such as physics or chemistry.

Courses taken at other fully accredited colleges and universities in the United States or at recognized universities abroad are carefully and thoroughly reviewed for award of transfer credit. Except for a student transferring from a Florida community college or other college with which Florida Tech has an articulation agreement, the student must provide college catalogs containing descriptions of all courses taken. Course outlines or syllabi are also helpful in assuring that all earned transfer credit is received. In the case of courses taken at a foreign university, detailed course outlines are required for transfer credit.

If there is doubt about the equivalency of a course taken elsewhere, the student is required to pass an equivalency examination to receive university credit for the course. In any case, where transfer credit is not awarded for a course passed at another college or university, the student may request an equivalency examination.

Guide for Community College Transfers

Students entering majors other than chemical engineering, computer science, environmental science or oceanography can complete their bachelor's degree programs at Florida Tech within five semesters (68 to 78 credit hours) by transferring the courses indicated in the following list of "Recommended Courses to be Transferred." Students majoring in other fields can also expect to graduate in comparable periods of time by transferring appropriate courses, as indicated by the program descriptions in this catalog. Additional transfer credits, such as electric circuit theory for engineering majors, could reduce the time and credits remaining for graduation. Prior contact with the appropriate academic unit is recommended for students planning to transfer to Florida Tech.

Students transferring from Florida community colleges who meet the conditions established in the Articulation Agreement between Independent Colleges and Universities of Florida and the Florida State Board of Community Colleges can graduate within 67 to 75 credit hours, depending on the field of study.

Recommended Courses to be Transferred

SUBJECT AREA	CREDITS
Calculus	12
Differential Equations	3
General Chemistry*	8
Physics (Calculus-based)*	10
Applied Mechanics (Statics, Dynamics)	6
English Composition	3
History of Civilization	6
Economics	3
Humanities/Social Science Electives	9
TOTAL CREDITS	60

**Including laboratories*

Selection of a Major

A student typically selects a major at the same time the application for admission is submitted. A faculty adviser, affiliated with the major program, is assigned prior to the start of classes. A student who prefers to postpone the selection of a major may initially enroll in the first-year nondegree General Engineering program described below. However, selection of a degree program should occur by the start of the sophomore year.

As long as the requirements for continued enrollment (see *Undergraduate Information and Regulations* section) are met, students are permitted to remain in their selected major. A change of major can be initiated by the student, but is subject to the approval of the new academic department head. Students can generally change majors between any two closely related degree programs during the sophomore

year or even during the early part of the junior year without greatly increasing the time needed to complete all degree requirements.

Course Loads

The normal course load taken by students in the College of Engineering is about 17 credit hours. Students may enroll for lighter loads and are strongly encouraged to do so if difficulty is experienced in keeping up with all course work when a full load is attempted, even though the duration of the program would of necessity be extended from eight semesters to nine or more semesters.

Cooperative Education

Students in the College of Engineering are encouraged to participate in a cooperative education program. The Office of Career Services and Cooperative Education exists to help students participate in a program that alternates periods of work experience in a chosen field with academic semesters spent on campus as a full-time student.

Participants in this program are able to earn some of the funds needed to further their education while gaining valuable, practical experience and a knowledge base that is useful in better defining career goals. The length of time needed to earn a degree is extended by an amount comparable to the number of semesters spent away from the campus. Students in this program should pay special attention to scheduling their courses well in advance to avoid conflicts between off-campus periods and the semesters when required courses are offered.

General Engineering

ASSOCIATE DEAN, ACADEMICS
E.H. Kalajian, Ph.D., P.E.

A student who wishes to postpone the selection of a major may enroll for up to one year as a general engineering student, following the curriculum described below. This curriculum is designed to allow students more time to become familiar with all College of Engineering academic programs. Students are urged to select degree programs as early in the year as possible; those who take the courses listed below and no others for the entire freshman year may have up to 12 credit hours of course work to make up later.

Freshman Year Curriculum

FALL	CREDITS
CHM 1101 General Chemistry 1	4
COM 1101 Composition and Rhetoric	3
EGN 1000 Introduction to Engineering	3
MTH 1001 Calculus 1	4
	14

SPRING	
COM 1102 Writing about Literature	3
CSE 1502 Introduction to Software Development with C++	3
or	
CSE 1503 Introduction to Software Development with FORTRAN	3
MTH 1002 Calculus 2	4
PHY 1001 Physics 1	4
PHY 2091 Physics Lab 1	1
	15

Students in this program are advised by the associate dean of engineering until a degree program is selected. Once 30 credit hours (not including remedial courses) have been successfully completed, the student is expected to select a degree program. Acceptance into the desired degree program is automatic unless the student has been academically dismissed.

Aerospace Engineering

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING
J.J. Engblom, Ph.D., Head

Bachelor of Science *Master of Science* *Doctor of Philosophy*

Areas of Specialization:
Aerodynamics and Fluid Dynamics
Aerospace Structures and Materials
Combustion and Propulsion

Professor

L. Krishnamurthy, Ph.D., *fluid dynamics of chemically reacting flows, combustion theory, turbulence modeling, computational fluid dynamics, asymptotic analyses and perturbation techniques, fire research, aerospace propulsion.*

Associate Professors

David C. Fleming, Ph.D., *structural mechanics, advanced composite materials, crashworthy aerospace vehicle design, finite element analysis, fracture mechanics.*

John M. Russell, Sc.D., P.E., *fluid dynamics, mathematical theory of shear flow instability, constitutive theory, dynamics of vortex tubes and filaments, applied aerodynamics, flight vehicle stability and control, mathematics.*

Paavo Sepri, Ph.D., *fluid mechanics, turbulence, convective heat transfer, boundary layers, aerodynamics, wind tunnel testing, droplet combustion, computational fluid dynamics.*

Chelakara S. Subramanian, Ph.D., P.Eng. (UK), *experimental fluid mechanics, turbulence measurements, LDV, photoluminescence barometry and thermometry, wind tunnel experimentation, wind engineering, structure of complex turbulent flows, turbulence modeling, boundary layer receptivity, energy efficient systems, film cooling.*

The field of aerospace engineering has grown rapidly in recent decades to assume a vital role in modern human endeavors. Ranging from manned lunar excursions, exploration of the solar system and ecological study of the earth, to beneficial commerce on space stations, high-quality products

for humans and military concerns, the contributions from the aerospace engineering profession have been profound. Recent accomplishments in airframe materials, computational fluid dynamics and propulsion system designs have resulted in the circumnavigation of the earth by an airplane without recourse to refueling. In the future, aerospace engineers can be expected to take part in moon-base and space station activities, and manned exploration of Mars. As has occurred in the past, the many spin-offs from these activities will benefit humanity on earth.

Bachelor of Science Degree Program

The aerospace engineering undergraduate curriculum at Florida Tech presents the fundamentals underlying modern aerospace engineering and prepares the student for a lifetime of continued learning. During the freshman and sophomore years, emphasis is placed on mathematics and physics, while aerospace engineering is introduced through a sequence of three courses. The sophomore and junior years direct the student toward the engineering sciences, including materials science, thermodynamics and fluid mechanics. During the junior and senior years, the study becomes progressively centered about the specific issues facing practicing aerospace engineers. The student uses the basic tools imparted during the first two years and applies them in studies of aerodynamics, propulsion systems, aerospace structures and design projects. Other courses taken during the last two years expand the student's knowledge in the fields of mechanics of solids, electric circuits, flight stability and control, and mission analysis. Technical electives taken during the junior and senior years allow the student to direct the program toward specific areas of personal interest, such as flight training and human factors engineering, space science, mathematics, computer science or other engineering disciplines.

Laboratory experiences are essential to the education of engineers, and these are provided in chemistry, physics, computers, materials, fluids, structures and experimental aerodynamics. The capstone of the educational process is embodied in the aerospace engineering design project, which synthesizes and focuses elements from the various disciplines into a design activity of current aerospace engineering interest. The faculty of the program serve jointly in the supervision and consultation for these projects.

Students are encouraged to define career objectives early in the program (preferably during the sophomore year), so that, in consultation with faculty advisers, electives can be selected that are best suited to the achievement of specific goals.

Students may also choose to benefit from the experience gained through the cooperative education program.

After graduation, the aerospace engineering student is prepared to pursue a career in either industry or government as a practicing engineer, or to enter graduate study in engineering, applied mechanics or mathematics.

The mission of the mechanical and aerospace engineering department is to graduate students who are well grounded in the engineering sciences, can design and conduct experiments, have the ability to design complex components and systems, and understand manufacturing processes. Our objectives include instilling in our graduates an ability to function on multidisciplinary design teams; to identify, formulate and solve engineering problems; to understand the impact of their solutions in a global/societal context; to understand their professional and ethical responsibilities; to communicate effectively; and to recognize the importance of lifelong learning opportunities and of a knowledge of contemporary issues relevant to their profession.

Degree Requirements

Candidates for a Bachelor of Science in Aerospace Engineering must complete the minimum course requirements outlined in the following curriculum.

Freshman Year

FALL		CREDITS
CHM 1101	General Chemistry 1	4
COM 1101	Composition and Rhetoric	3
CSE 150x	Introduction to Software Development (May be either CSE 1502 or CSE 1503)	3
MAE 1201	Introduction to Aerospace Engineering	1
MTH 1001	Calculus 1	4
		15

SPRING		
COM 1102	Writing about Literature	3
MAE 1202	Aerospace Practicum	2
MTH 1002	Calculus 2	4
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
	Social Science Elective	3
		17

Sophomore Year

FALL		CREDITS
HUM 2051	Civilization 1	3
MAE 2081	Applied Mechanics: Statics	3
MAE 2201	Aerospace Fundamentals	2
MTH 2001	Calculus 3	4
PHY 2002	Physics 2	4
PHY 2092	Physics Lab 2	1
		17

SPRING		
CHE 3260	Materials Science and Engineering	3
CHE 3265	Materials Science and Engineering Lab	1
HUM 2052	Civilization 2	3
MAE 2082	Applied Mechanics: Dynamics	3
MAE 3191	Engineering Thermodynamics 1	3
MTH 2201	Differential Equations/Linear Algebra	4
		17

Junior Year

FALL		CREDITS
COM 2223	Scientific and Technical Communication	3
ECE 4991	Electric and Electronic Circuits	3
MAE 3061	Fluid Mechanics 1	3
MAE 3064	Fluid Mechanics Lab	1
MAE 3083	Mechanics of Materials	3
MTH 3101	Complex Variables	3
		16

SPRING		
MAE 3062	Fluid Mechanics 2	3
MAE 3241	Aerodynamics and Flight Mechanics	3
MAE 3291	Junior Design	1
MAE 4281	Aerospace Structural Design	3
MAE 4284	Aerospace Engineering Structures Lab	1
MTH 3201	Boundary Value Problems	3
	Technical Elective*	3
		17

Senior Year

FALL	CREDITS
MAE 3260 Experimental Aerodynamics	3
MAE 4242 Aircraft Stability and Control	3
MAE 4261 Air-breathing Engines	3
MAE 4291 Aerospace Engineering Design 1	3
Humanities Elective	3
Technical Elective*	3
	18

SPRING	
MAE 4262 Rockets and Mission Analysis	3
MAE 4292 Aerospace Engineering Design 2	3
Humanities/Social Science Elective	3
Technical Elective*	3
Free Elective	3
	15

TOTAL CREDITS REQUIRED 132

**A list of recommended Technical Electives is available from the Aerospace Engineering Program Office. Up to six credits of Technical Electives may be replaced by the following:*

AVF 1001 Flight 1, AVF 1002 Flight 2

AVT 1111 Aeronautics 1, AVT 1112 Aeronautics 2

Master of Science Degree Program

The master of science degree can be earned in one of three major areas: aerodynamics and fluid dynamics, aerospace structures and materials, and combustion and propulsion. Because the purpose of each program is to prepare the student for either a challenging professional career in industry or for further graduate study, the programs do not permit narrow specialization. Emphasis is on required course work in several disciplines in which an advanced-degree engineer in a typical industrial position is expected to have knowledge and problem-solving expertise beyond that normally obtained during an undergraduate engineering education.

The master of science degree can be earned on either a full-time or a part-time basis. Full-time students can complete the program in a minimum of three semesters (four in the case of graduate student assistants). Students beginning their course work during the spring semester will be able to register for full course loads, although the commencement of thesis work will normally be delayed.

Graduate student assistants are required to take the one-week teaching seminar offered in mid-August each year.

Admission Requirements

An applicant should have an undergraduate major in a field related to aerospace engineering. Applicants whose bachelor's degrees are in other fields are normally required to take some undergraduate course work in addition to the program described below, as determined by the department head. Applications are also invited from graduates with undergraduate majors in the physical sciences or mathematics. In these cases, at least one year of undergraduate course work in aerospace engineering is normally required prior to starting the master of science program. In evaluating an international application, due consideration is given to academic standards in the country where the undergraduate studies have been performed.

Master's applicants should take the Graduate Record Examination (GRE) General Test. Applicants from foreign countries must meet the same requirements as applicants from the United States.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The master of science degree in aerospace engineering is offered with both thesis and nonthesis options. Each option requires a minimum of 30 credit hours of course work. Prior to the completion of nine credit hours, the student must submit for approval a master's degree program plan to indicate the path chosen and the specific courses to be taken. For the thesis option, up to six credit hours of thesis work may be included in the 30 credit hours' requirement. The thesis can be primarily analytical, computational or experimental; or it can be some combination of these. In each case, students must demonstrate the ability to read the appropriate engineering literature, to learn independently and to express themselves well technically, both orally and in writing. For the nonthesis option, a student may replace the thesis with additional elective courses and a final comprehensive examination, following approval of a written petition submitted to the department head. Generally, students wishing to pursue an academic career are encouraged to choose the thesis option.

Curriculum

The program of study leading to the Master of Science in Aerospace Engineering is offered in the three listed areas of specialization. The minimum program requirements consist of nine credit hours of core courses, six credit hours of mathematics and 15 credit hours (which may include six credit hours of thesis) of electives.

The nine credit hours of core courses must be chosen in consultation with the student's adviser from one of the lists below.

Aerodynamics and Fluid Dynamics

MAE 5110 Continuum Mechanics
MAE 5120 Aerodynamics of Wings and Bodies
MAE 5130 Viscous Flows
MAE 5140 Experimental Fluid Dynamics
MAE 5150 Computational Fluid Dynamics
MAE 5180 Turbulent Flows

Aerospace Structures and Materials

MAE 5050 Finite Element Fundamentals
MAE 5410 Elasticity
MAE 5430 Design of Aerospace Structures
MAE 5460 Fracture Mechanics and Fatigue of Materials
MAE 5470 Principles of Composite Materials
MAE 5480 Structural Dynamics

Combustion and Propulsion

MAE 5130 Viscous Flows
MAE 5150 Computational Fluid Dynamics
MAE 5310 Combustion Fundamentals
MAE 5320 Internal Combustion Engines
MAE 5350 Gas Turbines
MAE 5360 Hypersonic Air-breathing Engines

Electives are selected from these course offerings and appropriate courses in mathematics, in consultation with the student's adviser and committee. The topics of emphasis for aerospace engineering in the three areas of specialization include aerodynamics, computational fluid dynamics, experimental fluid dynamics, flow instability theory, combustion, aerospace propulsion and power, aerospace structures, composite materials, fracture mechanics and fatigue of materials.

Doctor of Philosophy Degree Program

The doctor of philosophy degree program is offered for students who wish to carry out advanced research in any of the three areas of specialization listed under the master of science program. Other research areas within the field of aerospace engineering, which may be very actively pursued elsewhere, may not correlate well with current faculty interests and facility capabilities at Florida Tech and, therefore, may not be viable fields for doctoral study at this university.

Admission Requirements

A candidate for the doctoral program in aerospace engineering will normally have completed a master's degree in aerospace or mechanical engineering and have adequate preparation in areas of fundamental science and mathematics. Alternatively, a student enrolled in the master's program may apply to work directly toward the doctoral degree after completing at least 18 credits of graduate course work at Florida Tech with a cumulative grade point average of at least 3.5.

Doctoral applicants should have superior academic records, provide letters of recommendation and take the Graduate Record Examination General Test.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The degree of doctor of philosophy is conferred primarily in recognition of creative accomplishment and the ability to investigate scientific or engineering problems independently, rather than for completion of a definite curriculum. The program consists of advanced studies and research leading to a significant contribution to the knowledge of a particular problem. A student's research may have analytical, computational or experimental components, or some combination of these. Each student is expected to 1) complete an approved program of study beyond that required for a master's degree; 2) pass the comprehensive examination (both written and oral parts); 3) present a dissertation proposal acceptable to the student's committee; 4) complete a program of significant original research; and 5) prepare and defend a dissertation detailing the research work.

The program consists of 90 credit hours of study beyond the bachelor's degree or 60 credit hours beyond the master's degree. Candidates from both the thesis and nonthesis master's programs may be admitted into the doctoral program. However, students from the second category must have demonstrated exceptional potential for advanced study to be admitted. Of the 90 credit hours, 36 shall be for dissertation registration, although six credit hours of successfully completed master's thesis registration will normally be accepted into this category.

The purpose of the comprehensive examination is to cover the student's major field of study and related fields important to the major field. The examination is given when, in the judgment of the student's advisory committee, the student has had sufficient preparation in his/her field of study by completing significant course work in at least three areas of specialization, as well as in mathematics, and by initiating doctoral research. The examination must normally be taken before the end of the student's fourth academic semester after admission into the doctoral program. The written portion of the examination consists of individual parts given by each member of the advisory committee. These written examinations are intended to cover each of the student's areas of specialization and applied mathematics. The written portion of the comprehensive examination is followed by an oral component that provides the advisory committee an opportunity to complete the examinations in each of the student's areas of study. Subsequent to completion of both written and oral components of the comprehensive examination, a dissertation proposal must be submitted to the student's advisory committee for evaluation. Upon determining that the proposed research is of doctoral quality and that completion is feasible, the student is advanced to candidacy for the doctoral degree.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

The doctoral program of study must be approved by the student's advisory committee and the department head. Considerable latitude is allowable in course selection, although appropriate advanced courses are expected to form a part of the student's program. A representative distribution of these courses taken beyond the bachelor's degree should include, as a minimum, five courses in the major area and four, three and three courses (in any combination) in the two related areas and mathematics. These choices provide for the selection of three additional courses as electives. The following illustrates a representative doctoral program of study beyond the bachelor's degree.

Major Area (Specialization)	15
Two Related Areas (Specializations) and Mathematics	30
Electives	9
Dissertation (includes 6-credit thesis if completed)	36
TOTAL CREDITS REQUIRED	90

Selected course offerings from other engineering and science programs can be taken to fulfill the elective requirements. Each student takes electives from the course listings and from mathematics based on his or her areas of interest and in consultation with his or her committee.

Research Activities and Facilities

The research facilities of the aerospace engineering program include laboratories in energy research, fluid mechanics and aerodynamics, combustion and propulsion, metallurgy and solid mechanics, system dynamics and control, instrumentation and applied laser research, computer-aided design and computational research. Other laboratories around the campus can also be used by aerospace engineering graduate students performing advanced research.

Funded research activities of the aerospace and mechanical engineering faculty have included studies of efficient heat transfer and insulation mechanisms in building environments; combustion in porous media; advanced heating, ventilation and air-conditioning; fuel systems; computations of radiative transport; computational mechanics with emphasis on damage mechanisms in laminated composite structures; crashworthiness of aircraft structures; computation

of flows in turbine blade environments; turbulent boundary-layer structure with flexible roughness; experimental studies of pressure- and/or temperature-sensitive paints; material characterization using CW and short-pulse lasers; analysis and computation of natural convection, study of leaks in cryogenic seals; and turbulent transport of moisture contained in air streams. Other studies have involved convection and diffusion of radon gas in porous media, smart composite structures with embedded sensors and optimization of composites.

Laboratories include the Fluid Dynamics Laboratory and the Aerospace Structures Laboratory. The Fluid Dynamics Laboratory features a low-speed, low-turbulence wind tunnel of open-return type, with a square test section 0.535 m on a side and 1.6 m long. The speed range is from zero to 42 m/s. The mean turbulence level is a few hundredths of one percent at the lowest tunnel speeds. The Aerospace Structures Laboratory features a drop-tower for impact testing of structures and materials. This laboratory also has a shaker table for the vibration testing of structures. There are also ovens, vacuum pumps and other paraphernalia needed for the custom preparation of material specimens from advanced composite materials.

Aerospace engineering students also have access to other laboratories in the College of Engineering. Of special interest in this context are the laboratories listed in the mechanical engineering portion of this catalog, because the aerospace engineering program has many laboratory courses in common with the mechanical engineering program.

Chemical Engineering

DEPARTMENT OF CHEMICAL ENGINEERING
P.A. Jennings, Ph.D., Head

Bachelor of Science *Master of Science* *Doctor of Philosophy*

Associate Professors
Paul A. Jennings, Ph.D., *reactor engineering, chemical and biological processes used in waste treatment and recycling.*

Manolis M. Tomadakis, Ph.D., *transport processes (diffusion and conduction) in porous and composite media, materials characterization through computer simulations, plasma-enhanced chemical vapor deposition, pressure-swing adsorption.*

Jonathan E. Whitlow, Ph.D., P.E., *multivariable process control, adaptive control, neural networks, expert systems, supercritical fluids.*

Assistant Professors
James R. Brenner, Ph.D., *hydrogen storage, fuel cells, materials synthesis/structure/function relationships, specialty polymers, separations and catalysts, pharmaceuticals, biosensors.*

Maria E. Pozo deFernandez, Ph.D., *diffusion in polymers, properties of polymer systems, thermodynamics, fluid phase equilibria at high pressures, supercritical fluids, sol-gel.*

Professor Emeritus
Donald R. Mason, Ph.D.

Adjunct Professor
Michael R. Shaffer, Ph.D., P.E.

Bachelor of Science Degree Program

Chemical engineering is primarily the application of chemical principles to industrial processes and environmental problems to effect a change in the composition and properties of matter to benefit society and the environment. A graduate in chemical engineering has the basic training to solve problems in transport and separation processes, process dynamics and control, energy production, food and petrochemical processing, materials synthesis and processing, and chemical equipment and plant design.

In support of the mission of the university, the objectives of the chemical engineering department are to provide: undergraduate and graduate level curricula that offer students the opportunity to obtain the knowledge and skills required to enter the chemical engineering profession; an atmosphere that stimulates intellectual curiosity and encourages creative interaction between students and faculty; opportunities for students and faculty to engage in research and other activities to obtain knowledge and skills beyond those obtained in traditional course work; opportunities for students and faculty to interact with and serve the local community; and continuing educational opportunities for alumni and members of the community beyond the limitations of traditional on-campus course work.

The freshman and sophomore years emphasize basic mathematics, science and communication skills; the junior year fundamentals of chemical engineering; and the senior year integration of those fundamentals in capstone design courses. Elective course work also allows students to broaden their knowledge in other technical fields, to deepen their understanding in an area of specialization, or to participate in a technical research project under the direction of an individual faculty member.

Admission Requirements

Students seeking admission should have one year of high school biology, chemistry and physics, in addition to at least three years of mathematics, including algebra, geometry and trigonometry.

Degree Requirements

A Bachelor of Science in Chemical Engineering requires a minimum of 133 credit hours as specified below. Because the subject matter in general chemistry forms a critically important foundation for the advanced chemistry courses as well as all chemical engineering courses, chemical engineering majors must pass both CHM 1101 and CHM 1102 with grades of at least C before taking any 2000-level chemistry or chemical engineering courses.

Students must successfully complete all courses listed for the freshman year before registering for upper-level (3000/4000) courses. Students must successfully complete all courses listed for the sophomore year before registering for CHE 4181.

Freshman Year

FALL	CREDITS
BUS 1301 Basic Economics	3
CHE 1101 Introduction to Chemical Engineering 1	2
CHM 1101 General Chemistry 1	4
COM 1101 Composition and Rhetoric	3
MTH 1001 Calculus 1	4
	16

SPRING	
CHE 1102 Introduction to Chemical Engineering 2	1
CHM 1102 General Chemistry 2	4
COM 1102 Writing about Literature	3
MTH 1002 Calculus 2	4
PHY 1001 Physics 1	4
PHY 2091 Physics Lab 1	1
	17

Sophomore Year

FALL	CREDITS
CHE 2101 Chemical Process Principles 1	3
CHM 2001 Organic Chemistry 1	3
CHM 2011 Organic Chemistry Lab 1	2
MTH 2201 Differential Equations/Linear Algebra	4
PHY 2002 Physics 2	4
PHY 2092 Physics Lab 2	1
	17

SPRING	
CHE 2102 Chemical Process Principles 2	3
CHE 3260 Materials Science and Engineering	3
CHE 3265 Materials Lab	1
CHM 2002 Organic Chemistry 2	3
HUM 2051 Civilization 1	3
MTH 2001 Calculus 3	4
	17

Junior Year

FALL	CREDITS
CHE 3131 Transfer Processes 1	4
CHE 3141 Chemical Process Analysis	2
CHE 3170 Introduction to Environmental Engineering	3
CHM 3001 Physical Chemistry 1	3
CHM 3011 Physical Chemistry Lab 1	2
HUM 2052 Civilization 2	3
	17

SPRING	
CHE 3110 Chemical Engineering Thermodynamics	3
CHE 3132 Transfer Processes 2	4
CHE 4121 Chemical Process Control	4
COM 2223 Scientific and Technical Communication	3
Restricted Elective (Advanced Chemistry)	3
	17

Senior Year

FALL	CREDITS
CHE 4105 Unit Operations Lab	2
CHE 4131 Separation Processes	3
CHE 4151 Chemical Engineering Reactor Design	3
CHE 4181 Chemical Engineering Plant Design 1	3
Humanities Elective	3
Technical Elective*	3
	17

SPRING	
CHE 4182 Chemical Engineering Plant Design 2	3
Social Science Elective	3
Technical Electives*	6
Free Elective	3
	15

TOTAL CREDITS REQUIRED 133

**BUS 3501 (Management Principles) or BUS 3601 (Marketing Principles) may be taken in place of three credits of Technical Elective. CWE 1001 may be taken as the Free Elective; CWE 2001 may be taken in place of three credits of Technical Elective.*

Selection of Electives

The Restricted Elective (Advanced Chemistry) should be satisfied by completion of one of the following courses:
BIO 4010 Biochemistry 1
CHM 3002 Physical Chemistry 2
CHM 3301 Analytical Chemistry 1
CHM 4222 Environmental Chemistry
CHM 4550 Polymer Chemistry

A list of other recommended electives is available in the chemical engineering office.

Emphasis in Business

Because chemical engineers often take graduate-level course work in business or management at some point in their careers, many students majoring in chemical engineering choose one or more courses in business as electives. A list of courses recommended as preparation for graduate-level course work in business is available in the chemical engineering office. Students interested in pursuing graduate degrees in business or management are also encouraged to contact the office for more information

Emphasis in Environmental Engineering

Because chemical engineers are often responsible for design and operation of pollution-control equipment, many students majoring in chemical engineering choose one or more courses in environmental engineering as electives. A list of recommended electives is available in the chemical engineering office. Students interested in environmental engineering as an area of graduate study or professional employment are encouraged to contact the office for more information.

Emphasis in Materials Science and Engineering

Because chemical engineers are often responsible for development and production of materials for uses ranging from spacecraft to electronics, many students majoring in chemical engineering choose one or more courses in materials science and engineering as electives. A list of recommended electives is available in the chemical engineering office. Students interested in materials engineering as an area of graduate study or professional employment are also encouraged to contact the office for more information.

Chemistry/Chemical Engineering Dual Degree Program

Because the chemical engineering curriculum requires much of the same course work required by the chemistry curriculum, a student may wish to pursue a program that satisfies degree requirements for both majors. This program normally requires one additional year of residency. The bachelor's degree in chemistry may be awarded after completing the first four years. Interested students should contact either the chemistry office or the chemical engineering office for more information.

Five-Year Master's Degree Program

More than one-fourth of all chemical engineering graduates choose to continue their education beyond the bachelor's degree. The five-year program offers students the opportunity to complete a master's degree in one calendar year following completion of requirements for the bachelor's degree. To qualify, a student must possess a grade point average of 3.0 or above following his or her junior year. Additional information concerning this program may be obtained by contacting the department head.

Master of Science Degree Program

The objective of the master of science program is to study the basic principles of chemical engineering in greater depth, including transport phenomena, thermodynamics, reactor design and process control. Electives in other areas to broaden the students' exposure are also required. The program's emphasis is research and the writing of a thesis on a current problem. The results of the thesis must be publishable in a technical journal. Students are advised to see members of the faculty to determine compatibility of interests before selecting a research area. Program policies are available in the program office.

Admission Requirements

The applicant must have a Bachelor of Science in Chemical Engineering or its equivalent. Applicants with degrees in other fields of engineering, or in science or mathematics, are ordinarily required to take preparatory undergraduate courses prior to starting the master of science program. These courses are established by the faculty adviser and the program chair when the student obtains admission to the program.

General admission requirements and the application process are detailed in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The Master of Science in Chemical Engineering requires satisfactory completion of 30 credit hours, including six credit hours of thesis, as shown below. Required courses include the zero-credit Chemical Engineering Seminar that all graduate students are required to register for and attend every semester. The nine elective credits may be satisfied by taking chemical engineering graduate courses, or other courses approved by the graduate adviser. The degree also requires completion of an independent research project, the writing of a thesis and its successful defense.

Curriculum

Each student establishes an appropriate program of study with the guidance of a graduate committee, subject to final approval by the department head, prior to the completion of nine semester hours of graduate study.

CHE	5100	Chemical Engineering Seminar 0
CHE	5101	Transport Phenomena 1 3
CHE	5110	Equilibrium Thermodynamics 3
CHE	5120	Process Control 3
CHE	5150	Chemical Reactor Design 3
CHE	5999	M.S. Thesis in Chemical Engineering 6
		Electives 12

Areas of Specialization

The student may select electives and the thesis topic to provide an emphasis in any of the following areas:

- Environmental Engineering
- Materials Synthesis, Processing and Characterization
- Transport and Separation Processes
- Computer-aided Modeling, Processing and Control

Doctor of Philosophy Degree Program

The doctoral program is primarily for students who wish to develop independent research or problem-solving and critical thinking abilities. Research areas must be related to the faculty's interests.

Admission Requirements

General admission requirements and the application process are covered in the *Graduate Information and Regulations* section of this catalog.

Admission to the doctoral program normally requires the completion of a master's degree in chemical engineering. However, students enrolled in the Florida Tech master's program may apply to be admitted directly to the doctoral program after completing 18 credits with a cumulative grade point average of 3.5 or more, if there is evidence of the ability to pursue problems independently.

Doctoral applicants must demonstrate outstanding scholastic achievements and aptitude, provide letters of recommendation from previous professors, including the M.S. thesis adviser and provide results of a recent GRE test including both the General Test and Subject Test in Engineering.

Degree Requirements

The doctor of philosophy degree is a recognition of one's independent creative ability to research, delineate and solve novel, significant scientific and/or engineering problems. Results of such work must be publishable in refereed journals. Course work is also included in support of these objectives.

Each student is expected to: 1) complete an approved program of study; 2) pass both oral and written examinations; 3) propose and complete an original research project; and 4) write and defend a dissertation on the research work.

The Ph.D. in chemical engineering requires a minimum of 48 credits after the completion of a master's degree, including at least 24 credits of course work in chemical engineering (12 after the master's degree) and nine credits in mathematics, and satisfaction of the general doctoral degree requirements presented in the *Graduate Information and Regulations* section of this catalog. The written examination covers chemical engineering and related mathematical, physical and chemical sciences. The oral examination includes the presentation of a research proposition developed independently by the student to demonstrate ability to create and develop a research idea. The written and oral examinations are normally taken before the end of the fourth academic semester, counted from the semester of admission to the doctoral program. The dissertation may be theoretical, computational, experimental or a combination of the three in any of the areas of specialization shown in the section on the master's degree.

Research Activities and Facilities

Current research activities are within the scope of the areas of specialization previously stated.

In environmental engineering, activities have included experimental studies of biochemical reactors, and theoretical and experimental investigations of advanced water treatment processes such as activated carbon absorption. Current research includes experimental studies in ion exchange and membrane separation, as well as theoretical and experimental investigation of separation through pressure-swing adsorption of a gaseous product of phosphogypsum biodegradation.

In materials synthesis, processing and modeling, ongoing activities are in sol-gel processing of ceramic fibers that may be used in ceramic matrix composites, modeling of ceramic matrix composite properties and reaction kinetics and transport processes in the chemical vapor deposition of hydrogenated amorphous silicon for use as a solar cell. Research on transport properties of porous and composite media during chemical vapor infiltration is actively being pursued, as well as modeling the sputtering-assisted plasma-enhanced chemical vapor deposition of dielectric films in microelectronics manufacturing. Use of supercritical fluids for extraction of citrus oil and other chemical processing applications is being studied. A new method for recognition and purification of chiral isomers, known as molecular imprinting, is being developed for anticipated pharmaceutical applications.

The department has several ongoing projects in the area of hydrogen technology, focusing on storage in metal hydrides and carbon nanostructures, generation of hydrogen via reforming of methanol or gasoline and deactivation of hydrogen fuel cells.

In the area of computer-aided modeling, processing and control research is ongoing in the area of adaptive control for both single loop and multivariable applications. Neural networks are being investigated for use in nonlinear control as well as other areas of model development in which traditional models are constrained. Other topics of research interest include the development of artificial intelligence and expert system software.

Civil Engineering

DEPARTMENT OF CIVIL ENGINEERING
A. Pandit, Ph.D., P.E., Head

Bachelor of Science | *Master of Science* | *Doctor of Philosophy*

Areas of Specialization:
Construction Management
Environmental
Geo-Environmental
Geotechnical
Structures
Water Resources

Professors
Paul J. Cosentino, Ph.D., P.E., *pavement design and evaluation, transportation planning, containment of hazardous wastes, geotechnical engineering with emphasis on in situ testing and slope stability.*

Edward H. Kalajian, Ph.D., P.E., *geotechnical engineering, foundations, stabilization of waste materials.*

Ashok Pandit, Ph.D., P.E., *groundwater hydraulics and hydrology, numerical methods in subsurface modeling, hydraulic design, stormwater management.*

Associate Professors
Howell H. Heck, Ph. D., P.E., *solid wastes management, degradable materials, determining the ultimate fate of chemicals in disposal facilities.*

Jean-Paul Pinelli, Ph.D., P.E., *structural dynamics and earthquake engineering, modeling and optimization of nonlinear mechanical systems, computer-aided design techniques in structural engineering.*

Adjunct Professors
R.E. Bickford, J.D.; D.W. Fisher, J.D., P.E.; E.J. Kinberg, J.D.

Professors Emeriti
Maurice K. Kurtz Jr., Ph.D., P.E.; Jack W. Schwalbe, M.S., P.E.

Lecturer
G. Lucci, M.S.

Civil engineering extends across many technical specialties, such as construction, environmental, geological, structures, transportation and water resources, that interact with each other. The planning, designing and constructing of facilities and infrastructure systems used in public and private sectors are the responsibility of the civil engineer. Civil engineers work with architects and other engineers designing and constructing buildings, bridges, highways, aerospace facilities, ocean structures, ports and harbors, and utility facilities. Many civil engineers are involved in the solution and prevention of environmental problems and work on water resources management, soil and groundwater cleanup, and solid and hazardous waste management.

Some Florida Tech students select an environmental engineering emphasis to prepare for careers concerned with the treatment and distribution of water and water resources, as well as the management, treatment and reuse of wastewater, soil remediation, groundwater cleanup and solid waste management.

Employment opportunities in civil engineering can be found in technical, administrative or commercial work with manufacturing, design, construction, transportation or power companies; with city, state or federal agencies; and with architectural and engineering firms.

The mission of the civil engineering department is to provide state-of-the-art education in a caring and nurturing environment, helping students achieve their full potential. The educational objectives are to produce graduates who will find career growth opportunities both during school and after graduation; understand the need for continued professional growth; have a broad understanding of the various civil engineering disciplines; communicate well; and can work effectively in socially and ethnically diverse teams, with high standards of professional integrity and ethical responsibility.

Bachelor of Science Degree Program

The civil engineering curriculum is designed to prepare students for professional careers and graduate school. During the first two years, emphasis is placed on foundation courses in chemistry, mathematics, physics and engineering mechanics, augmented by practice-oriented civil engineering courses. The introductory civil engineering courses include field trips and introduction to various disciplines of civil engineering. The CAD lab course, using the latest CAD software, provides knowledge that is applied in the rest of the curriculum, as do the engineering materials and construction measurement courses.

During the second and third years, emphasis is on courses in the main disciplines of civil engineering—construction, environmental/water resources, geotechnical, structures and transportation—that further develop analytical skills in preparation for design courses in the last two years. The emphasis in the third and fourth years is on design. The curriculum provides flexibility in the form of restricted electives and a technical/business elective that allow further depth in a discipline of choice, or further breadth.

Altogether, students are required to take five civil engineering laboratory courses to understand concepts and to learn, firsthand, what works and what does not. Each student is also required to be part of a multi-disciplinary design project team that identifies, formulates and designs a real-world project. In this course, students must assemble information gleaned from previous courses. Students are also required to take courses in professional communication to develop both oral and written communication skills, and humanities and social science electives for a broader knowledge of human culture and the relationship of the individual to society.

Freshman Year

FALL		CREDITS
CHM 1101	General Chemistry 1	4
COM 1101	Composition and Rhetoric	3
CVE 1000	Introduction to Civil Engineering	3
CVE 1001	Computer Applications Lab	1
MTH 1001	Calculus 1	4
	Free Elective	1
		16

SPRING		
COM 1102	Writing about Literature	3
CVE 2080	Construction Measurements	3
MTH 1002	Calculus 2	4
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
	Social Science Elective	3
		18

Sophomore Year

FALL		CREDITS
CVE 3012	Engineering Materials	3
CVE 3013	Civil Engineering Materials Lab	1
MAE 2081	Applied Mechanics: Statics	3
MTH 2001	Calculus 3	4
PHY 2002	Physics 2	4
PHY 2092	Physics Lab 2	1
		16

SPRING		
COM 2223	Scientific and Technical Communication	3
HUM 2051	Civilization 1	3
MAE 2082	Applied Mechanics: Dynamics	3
MAE 3083	Mechanics of Materials	3
MTH 2201	Differential Equations/Linear Algebra	4
	Free Elective	1
		17

Junior Year

FALL		CREDITS
CVE 3015	Structural Analysis and Design	3
CVE 3030	Fluid Mechanics	3
CVE 3033	Hydraulics Lab	1
CVE 3042	Water and Wastewater Systems for Land Development	3
HUM 2052	Civilization 2	3
MTH 2401	Probability and Statistics	3
		16

SPRING		
CVE 3020	Soils and Foundations	3
CVE 3021	Soil Mechanics Lab	1
CVE 3032	Hydraulics and Hydrology	3
CVE 4000	Engineering Economy and Planning	3
One of the following four courses		3
CVE 4011	Computer Analysis of Structures	3
CVE 4013	Steel Structures	3
CVE 4016	Reinforced Concrete Structures	3
CVE 4019	Timber Structures	3
	Business or Technical Elective	3
		16

Senior Year

FALL		CREDITS
CVE 4060	Transportation Engineering	3
CVE 4070	Construction Engineering	3
CVE 4091	Design Project 1	1
CVE xxxx	Restricted Elective (Civil Engineering)	3
ECE 4991	Electric and Electronic Circuits	3
or		
MAE 3191	Engineering Thermodynamics	3
One of the following three courses		3
BUS 4503	Business Ethics	3
HUM 2540	Ethics	3
HUM 2570	Bioethics	3
		16

SPRING		
CVE 4092	Design Project 2	3
CVE xxxx	Restricted Electives (Civil Engineering)	6
COM 3070	Professional Communication for Executives	3
	Humanities Elective	3
	Free Elective	1
		16

TOTAL CREDITS REQUIRED 131

Restricted electives may be selected, with approval, from other upper division courses in civil engineering or related fields.

Environmental Engineering Emphasis

Students selecting the environmental engineering emphasis should select three of the following five courses as their restricted electives: CVE 3050, CVE 4035, CVE 4050, ENS 3101, OCN 3201.

Master of Science Degree Program

The master of science program in civil engineering allows the engineer the opportunity to apply recent technological developments to the solution of current civil engineering problems. The objective of the program is to provide opportunities for the student's development of professional engineering competence and scholarly achievement. Construction management, environmental, geo-environmental, geotechnical, structures and water resources are the areas of major emphasis for graduate study. The program is structured so that the student will attain an academic mastery in one of the areas of study within civil engineering.

The Master of Science in Civil Engineering may be earned on either a full-time or part-time basis. A student may begin graduate studies in any semester except summer. Fewer scheduling problems will occur for those who begin in the fall semester. International students who wish to improve their English proficiency may choose to enroll in English language classes during the summer prior to beginning their graduate studies. Graduate courses are offered in the evening to allow part-time students to complete the degree requirements.

Admission Requirements

An applicant should have a bachelor's degree in civil engineering. An applicant whose degree is in another field of engineering, or mathematics or the physical sciences, may be accepted but will be required to remedy any deficiencies by satisfactorily completing undergraduate courses in preparation for graduate study in civil engineering. Applicants must submit two letters of recommendation from academic references and a "statement of purpose" addressing reasons for graduate study in civil engineering. General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

Civil engineering offers the master of science program with areas of specialization in construction, environmental, geo-environmental, geotechnical, structures and water resources. The master of science degree is conferred on students who have successfully completed a minimum of 30 credit hours in either a thesis or nonthesis program consisting of required and elective course work. All graduate students on full or part assistantships (either teaching or research) are required to enroll in the thesis program. Students in the thesis program must successfully defend their theses, while students in the nonthesis program are required to pass comprehensive examinations.

Curriculum

Thesis students enroll in 12 hours of required civil engineering courses, six hours of thesis, and 12 hours of elective courses. Nonthesis students enroll in 12 hours of required courses and 18 hours of elective courses. Three to six hours of elective courses should be in the areas of mathematics and/or operations research. The following courses, by area of specialization, are required:

Construction Management

CVE 5035 Design Concepts in Urban Hydrology
or
CVE 5060 Highway Design
CVE 5072 Construction Contracts, Law and Specifications
CVE 5073 Construction Cost Engineering
ENM 5200 Project Engineering

Environmental

CVE 5035 Design Concepts in Urban Hydrology
CVE 5050 Design of Remediation Systems
CVE 5052 Solid Waste Management
ENS 5101 Introduction to Air Pollution

Geo-Environmental

CVE 5020 Geotechnical Engineering
CVE 5037 Numerical Groundwater Modeling
CVE 5039 Groundwater Hydrology and Contaminant Transport
CVE 5050 Design of Remediation Systems

Geotechnical

CVE 5020 Geotechnical Engineering
CVE 5025 Foundation Design
CVE 5060 Highway Design
OCE 5526 Advanced Coastal Engineering Structures

Structures

CVE 5014 Advanced Steel Design
CVE 5015 Structural Systems Design
CVE 5019 Design of Timber Structures
CVE 5020 Geotechnical Engineering
or
CVE 5025 Foundation Design

Water Resources

CVE 5035 Design Concepts in Urban Hydrology
CVE 5037 Numerical Groundwater Modeling
CVE 5039 Groundwater Hydrology and Contaminant Transport
ENS 5700 Introduction to Water Resources

Graduate elective courses in civil engineering and in other engineering disciplines are listed in the *Course Descriptions* section of the catalog and should be chosen in concert with the student's adviser. Numerous elective courses for each area of specialization are available, as posted on our Web site at www.fit.edu.

Doctor of Philosophy Degree Program

The doctor of philosophy program in civil engineering is offered for students who wish to conduct advanced research in one of the following two areas of specialization:

- Environmental/Water Resources
- Geotechnical/Structures

Admission Requirements

Admission to doctoral study is granted to a limited number of qualified applicants. The applicant will normally have received a bachelor's or master's degree from an accredited institution in a program that provides suitable preparation for doctoral-level studies in civil engineering. The applicant should have at least a 3.2 out of a possible 4.0 GPA for the most recently completed degree.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The doctor of philosophy degree is awarded in recognition of scientific accomplishment and the ability to investigate scientific problems independently. The program consists of advanced studies to prepare the student for scientific engineering research and completion of a research project that leads to a significant contribution to the knowledge of a particular problem. Each student should 1) pass the preliminary written and/or oral examination; 2) complete an approved program of study; 3) pass the comprehensive written and oral examination; 4) complete a program of significant research; 5) present the results of the research; and 6) prepare and defend a dissertation concerning the research. A minimum of 24 credit hours of course work and 24 credit hours of dissertation beyond a master's degree are required.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

The doctoral program of study must be approved by the student's advisory committee and the program chair. Considerable latitude is allowed in course selection provided at least 12 credits (beyond the master's level) are selected from courses in civil or environmental engineering. The remaining courses are selected, again in collaboration with the advisory committee, according to the interests and research objectives of the student. Academic courses for the selected areas of specialization can be selected from course offerings in various academic units as follows:

Environmental/Water Resources—Courses may be selected from academic programs in civil, chemical, mechanical or ocean engineering, environmental science, oceanography, mathematics, operations research and computer science.

Geotechnical/Structures—Courses may be selected from academic programs in civil, aerospace, mechanical or ocean engineering, environmental science, oceanography, mathematics and computer science.

Research Activities and Facilities

Research activities of the faculty encompass the major areas of civil engineering. Current research projects in structures and materials are in the areas of structural dynamics and wind engineering. Geotechnical research is concentrated in the areas of stabilization of waste materials for beneficial uses, in situ testing of soils, fiber-optic sensors in soils and evaluation of pavements. Research investigations in hydrology and water resources are related to development of new models and usage of existing models in the areas of numerical groundwater modeling, and design and performance of stormwater management systems. Model development is sometimes supplemented by field and laboratory experiments. Research activities in the environmental area include water treatment using reverse osmosis and activated carbon, biomass production, degradation of consumer products, landfill and compost simulation and solid wastes management.

Laboratories for research and instructional activities are available in the areas of materials and structures, soil mechanics, solid waste, unit operations and interactive graphics. Other campus laboratories can be used by students conducting graduate research. The materials and structures laboratory is equipped with several universal testing machines for physical testing, and equipment and instrumentation for experimental stress analysis. The soil mechanics laboratory contains commercial equipment for evaluating the engineering properties of soils. The solid-waste analysis laboratory is equipped to analyze solid wastes, to degrade solid wastes under both aerobic and anaerobic conditions, and to process solid wastes by a variety of methods.

Computer Engineering

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
J.C. Wheeler, Ph.D., Head

Bachelor of Science *Master of Science* *Doctor of Philosophy*

Professors
Barry G. Grossman, Ph.D., *fiber-optic sensor systems and smart structures, fiber-optic communications, optical computing and signal processing, neural network image and signal processing, acoustooptic and electrooptic devices.*

John Hadjilogiou, Ph.D., *switching theory, computer organization and architecture, fault diagnosis, reliable design.*

Fredric M. Ham, Ph.D., Harris Professor, *linear and nonlinear control systems, optimal control systems, optimal estimation, digital signal processing, system modeling, large-scale dynamical systems analysis and control, neural networks.*

Samuel P. Kozaitis, Ph.D., *automated feature extraction, optical pattern recognition, image processing.*

Kamel Rekab, Ph.D., *sequential analysis, design of experiments, applied data analysis.*

Thomas J. Sanders, Ph.D., Harris Professor, *solid-state devices, integrated circuit design and fabrication, manufacturing and reliability.*

Joseph C. Wheeler, Ph.D., *computer-processing algorithms, geophysical data, infrasonic and seismic sensors.*

Visiting Professor
Kenneth A. Ports, Ph.D., *semiconductor and microelectronic technology, radiation effects in semiconductors, nanotechnology.*

Associate Professors
Rufus H. Cofer Jr., Ph.D., *image processing, pattern recognition, radar signal processing, fault-tolerant computing.*

Raghvendra Deshmukh, Ph.D., *electronic circuits, digital systems, high-performance computer architecture, microprocessor applications, parallel processing.*

John S. Seybold, Ph.D., *communication systems, spread-spectrum communications, wireless systems, radar digital signal processing.*

M. Mehdi Shahsavari, Ph.D., *wireless networking, computer networks, telecommunications, development of secure distributed applications over the Internet, intrusion detection, component-based network management.*

Instructor
James Stanley, M.S.

Adjunct Professors
T. Crandell, Ph.D.; E. Hines, Ph.D.; P.M. Julich, Ph.D.; B.A. Myers, Ph.D.; J.K. Roach, Ph.D.; C. Zahm, Ph.D.

Student Coordinator
Sybil Snider

Bachelor of Science Degree Program

The goal of the computer engineering program is to provide the student with a total learning experience. The program is designed to expose the entire spectrum of computer engineering concepts from the basic building blocks of transistors and gates, through the progression of embedded controllers, computer architectures and complex computer system applications. Students develop an extensive knowledge of hardware, along with a strong education in concurrent programming techniques to provide them with a complete understanding of computer systems. In the senior year, they design, build and test "computer systems" as part of their senior design course.

The mission of the electrical and computer engineering department is to provide a top quality, state-of-the-art education to our graduates; to perform interdisciplinary research focusing on the needs of industry and government partners; and to provide technical and professional services to our local, state, national and international constituencies.

The program objective for computer engineering is to produce engineers with significant professional credentials. They will possess a fundamental knowledge and understanding of the mathematics and science applicable to computer engineering and will routinely demonstrate the ability to competently apply their knowledge to produce effective engineering solutions. Our graduates have experience in the use of modern tools for design, synthesis and analysis of

contemporary engineering challenges, and can integrate hardware and software. They exhibit ehical conduct and sensitivity to contemporary social issues. Able to function well on multidisciplinary teams, our graduates communicate effectively and engage in lifelong learning and continuous professional development.

A major component of the computer engineering program at Florida Tech involves hands-on learning. The computer engineering student begins taking computer engineering courses during the freshman year. The freshman-level courses include building and testing an actual computer board for subsequent expansion. Laboratory experience is integrated into most classes.

In computer engineering, a strong focus is on the mastery principle. It is assured that computer engineering students not only know the material critical to engineering, but that they can demonstrate mastery of the material, which is the goal of everyone in the program.

The information explosion via the Internet is so important to future conduct of business in the technology industry that the curriculum includes almost daily interaction of the student with the Internet. This includes the collection of information from other universities and the use of the Internet as a teaching aid and guide to the learning experience.

During the freshman and sophomore years, students learn the basics of computer engineering along with college-level mathematics and physics. In addition, courses in computer design with hands-on lab experience are taken both terms of the freshman year. In these courses, students design and build a working computer.

Throughout the sophomore and junior years, students learn basic analytical techniques of the engineer—ways in which the engineer views physical situations and uses mathematical techniques to design basic subsystems. Many of the courses taken by students at this level offer integrated lab experiences. In this way, students can visualize the practical aspects of the various theories they encounter.

During the senior year, students take courses that allow them to use previous knowledge to develop a system approach to engineering design. Through electives, students may explore various topics within computer engineering for which they have developed specific interests.

Degree Requirements

Candidates for the Bachelor of Science in Computer Engineering must complete the minimum course requirements as outlined in the following full-time curriculum. Deviations from the recommended program may be made only with the approval of the student's adviser and concurrence of the department head, in accordance with Accreditation Board for Engineering and Technology (ABET) criteria. Students may complete these requirements on a part-time basis.

Proficiency in certain key areas is of primary importance to success as computer engineers. For this reason, a student who receives a grade of D in any of the following courses is strongly urged to repeat the course to attain a grade of at least C: MTH 1001, MTH 1002, MTH 2001, MTH 2201; PHY 1001, PHY 2002, PHY 2003; ECE 2111, ECE 2112, ECE 3111.

Students are required to have successfully completed a minimum of 90 percent of all the courses listed below under the freshman and sophomore years before they will be allowed to register for upper-level (3000/4000) courses.

Students who have completed 24 credit hours and have not passed COM 1101 will register for this course in the next available semester. Students who have completed 48 credit hours and have not passed COM 1102 will register for this course in the next available semester.

The engineering science elective is limited to courses that help develop an appreciation of other branches of engineering. Courses that are acceptable as humanities/social sciences electives are identified as such in the *Course Descriptions* section of this catalog. Definitions of electives for engineering programs are presented in the *Undergraduate Information and Regulations* section.

Freshman Year

FALL	CREDITS
CHM 1101 General Chemistry 1	4
COM 1101 Composition and Rhetoric	3
ECE 1551 Digital Logic	4
MTH 1001 Calculus 1	4
	15

SPRING	
COM 1102 Writing about Literature	3
ECE 1552 Computer Design	4
MTH 1002 Calculus 2	4
PHY 1001 Physics 1	4
PHY 2091 Physics Lab 1	1
	16

Sophomore Year

FALL	CREDITS
ECE 2111 Circuit Theory 1	4
ECE 2551 Software/Hardware Design	3
HUM 2051 Civilization 1	3
MTH 2201 Differential Equations/Linear Algebra	4
PHY 2002 Physics 2	4
	18

SPRING	
ECE 2112 Circuit Theory 2	4
ECE 2552 Software/Hardware Integration	3
HUM 2052 Civilization 2	3
MTH 2001 Calculus 3	4
PHY 2003 Modern Physics	3
	17

Junior Year

FALL	CREDITS
ECE 3111 Electronics	4
ECE 3551 Microcomputer Systems 1	4
ECE 3541 Digital State Machines	3
ECE 3553 Multifarious Systems 1	4
MTH 2401 Probability and Statistics	3
	18

SPRING	
COM 2223 Scientific and Technical Communication	3
CSE 2410 Introduction to Software Engineering	3
ECE 3240 Junior Design	1
ECE 3552 Microcomputer Systems 2	4
ECE 4112 Digital Electronics	3
Engineering Science Elective*	3
	17

Senior Year

FALL	CREDITS
CSE 4001 Operating Systems Concepts	3
ECE 4241 System Design 1	3
ECE 4551 Computer Architecture	3
Humanities Elective	3
Restricted Elective (ECE/CSE)	3
Social Science Elective	3
	18

SPRING	
ECE 4242 System Design 2	3
ECE 4561 Computer Communications	3
Technical Elective	3
Free Elective	3
	12

TOTAL CREDITS REQUIRED 131

**The Engineering Science Elective must be one of the following:*
CHE 3260 Materials Science and Engineering
MAE 2081 Applied Mechanics: Statics
MAE 2082 Applied Mechanics: Dynamics
MAE 3083 Mechanics of Materials
MAE 3191 Engineering Thermodynamics 1

Master of Science Degree Program

The computer engineering program is committed to excellence in teaching, innovative and challenging research programs, and development of the finest faculty. A commitment to innovative research stimulates an excellent teaching and research program that allows graduates to use imaginative solutions to engineering problems. The program offers opportunities for graduates to pursue positions in private research, development, manufacturing, government and other areas.

The curriculum is flexible to allow opportunities to design an education program that is suited to individual academic goals. A background is provided in a variety of topics, including computer architecture, signal and image processing, high-performance computing and telecommunications. Effective interaction between related topics is an important aspect of the program. The faculty are engaged in research of significance and regularly collaborate with prominent scientists and engineers from industry and government. The low student-faculty ratio fosters a close relationship between faculty and students.

The opportunities for graduate education and research in computer engineering are wide-ranging. Although areas of specialization are listed under "Curriculum," there is a great deal of overlap in both technical content and faculty interest. As a result, there is considerable interaction among students and faculty across these areas, and a student may pursue studies that combine a variety of topics.

Admission Requirements

The applicant should have a bachelor of science degree from an electrical or computer engineering program accredited by the Accreditation Board for Engineering and Technology (ABET). In evaluating an international application, consideration is given to academic standards of the school attended and the type of undergraduate degree obtained. Applicants whose bachelor's degrees are in other engineering fields, mathematics or the physical sciences may be accepted, but they will be required to remedy any deficiencies by satisfactorily completing a number of undergraduate courses in preparation for graduate study in computer engineering.

Degree Requirements

The Master of Science in Computer Engineering is offered with both thesis and nonthesis options. Each option requires a minimum of 30 credit hours of approved graduate study. Prior to the completion of nine credit hours, the student must submit for approval a master's degree program plan to indicate the option chosen and the specific courses to be taken. Up to six credit hours of thesis work may be included in the 30-credit-hour requirement. The nonthesis option requires that the candidate satisfactorily complete a minimum of 30 credit hours of course work and the master's final program examination.

Curriculum

To earn the master of science degree, the student must complete:

Five courses from the following list	15
ECE 5256 Digital Image Processing	
ECE 5258 Pattern Recognition	
ECE 5534 Computer Networks 1	
ECE 5535 Computer Networks 2	
ECE 5536 Bit-Slice Architecture	
ECE 5551 High-Performance Computing and Communication Concepts	
ECE 5561 Switching Concepts	
ECE 5571 Digital System Design 1	
ECE 5572 Digital System Design 2	
ECE 5577 Diagnosis and Reliable Design of Digital Systems 1	
ECE 5578 Diagnosis and Reliable Design of Digital Systems 2	
ECE 5583 Multiprocessing Systems	
Two approved computer science and/or mathematics graduate courses	6
Approved electives, including up to 6 credits of thesis	9

TOTAL CREDITS REQUIRED 30

Areas of specialization include computer architectures, parallel processing, telecommunications, computer vision, design for testability, automatic test generation and development of secure distributed applications over the Internet. Each student plans a program of study in consultation with a member of the faculty whose professional field is related to the student's interest.

Program for Graduates from Other Fields

A student admitted to this program is expected to have a bachelor's degree from a regionally accredited institution or the equivalent, with an undergraduate major in an engineering discipline, mathematics or the physical sciences, and an academic and/or professional record indicating a high probability of success in graduate work. Preparatory courses required to provide a student with the background necessary for successful graduate study in computer engineering are listed below. Depending on the individual's background, other courses (e.g., differential equations and linear algebra) may also be required. Proficiency in these areas may be demonstrated by either successful course completion or by passing an equivalency examination. When possible, a student will be notified of deficiencies at the time of acceptance. In addition to the preparatory work described, all degree requirements listed above for the master of science degree must be fulfilled.

ECE 1552 Computer Design
ECE 2112 Circuit Theory 2
ECE 2551 Software/Hardware Design
ECE 3111 Electronics
ECE 4112 Digital Electronics

Doctor of Philosophy Degree Program

Admission Requirements

Admission to doctoral study is granted to a limited number of applicants who have received master's degrees in computer engineering from accredited institutions or from international institutions that provide suitable preparation for doctoral-level studies.

The doctoral program in computer engineering can be completed with a minimum of 48 credit hours beyond the master's degree; however, typically 48 to 54 credit hours are necessary. A list of elective courses is available on request.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The Doctor of Philosophy in Computer Engineering is conferred primarily in recognition of breadth of creative accomplishment and ability to investigate engineering problems independently, rather than for completion of a definite course of study. The work should consist of advanced studies and research leading to a significant contribution and knowledge of a particular problem.

Each student should 1) pass the preliminary examination; 2) complete an approved program of study beyond that required for a master's degree; 3) pass the comprehensive examination; 4) complete a program of significant original research; and 5) prepare and defend a dissertation concerning the research.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

COURSE WORK AND THESIS SUMMARY	CREDITS
Doctoral course work minimum beyond the master's degree	24
Doctoral research and dissertation	24
TOTAL MINIMUM BEYOND THE MASTER'S DEGREE	48

To assure that all graduates of the doctoral program possess a body of common knowledge, certain courses in computer engineering and related areas are required. If, in the judgment of the computer engineering graduate faculty, the student has acquired the equivalent knowledge of a particular subject during previous graduate study at another institution, the student is not required to take the course at Florida Tech.

The student's master's and doctoral course work combined should include a minimum of 24 credits in electrical or computer engineering and 15 credits in mathematics, computer science or operations research. The following courses are required:

CSE 5230 Operating Systems 1
ECE 5534 Computer Networks 1
ECE 5535 Computer Networks 2
ECE 5561 Switching Concepts
ECE 5571 Digital System Design 1
ECE 5577 Diagnosis and Reliable Design of Digital Systems 1
ECE 5583 Multiprocessing Systems
MTH 5051 Applied Discrete Mathematics
MTH 5411 Mathematical Statistics 1
SWE 5000 Introduction to Software Engineering

Research Activities and Facilities

Current areas of research activities include parallel and distributed processing, fault tolerant computing, VLSI architectures, analysis of algorithms, image analysis, optical computing, computer vision, image compression, high-performance computing, neural networks, telecommunications, application of fractals, speech and image processing, virtual reality, numerical analysis, rendering/image generation, computer communications, image understanding, object recognition, wavelet processing, floating-point co-processor design, interfacing, modern process architecture, pattern recognition and higher-order statistics. These activities are being carried out in relation to the following general areas of research interest.

High-Performance Computing

This area focuses on optimization of computational speed and size of various computer applications. Among the areas optimized are software-engineered computer communications between computer subsystems and dedicated hardware. Research includes advanced architectures and algorithms that exploit parallelism and communication on many levels for applications in visualization, advanced security, data protection, information processing and scientific computing.

Image Processing

Image processing is usually done on digital computers, but sometimes is performed by special electrooptical devices. Much of the research is directed at basic problems and contributes to the solution of major national problems in vision and image processing. These include automated object detection and perception, segmentation, texture analysis, nonlinear filtering, computer imaging, modeling and other areas of image analysis. Techniques being used include traditional techniques and other techniques that include wavelets, fractals, higher-order statistics and morphology. Application areas include autonomous inspection in manufacturing and other commercial uses. Projects include the analysis and interpolation of infrared or SAR imagery. Image compression is also being used for the efficient transmission and storage of images. In addition, many of the techniques in image processing can be applied to speech processing.

Advanced Computer Architecture

The goal of research in this area is to discover novel approaches to improve the performance of modern computer systems and reduce the complexity faced by application developers. Topics include computer security, reliability, highly parallel hardware-scheduled superscalars and fault tolerant computer systems with highly robust communications capabilities and built-in self-test algorithms.

Computer Networks

The abundance of computational power and communications requires a robust infrastructure, providing security, privacy, intrusion detection, multimedia capabilities and location dependent services. Research topics include component-based distribution network management, intrusion detection, interactive multimedia application over IP, congestion control, IP traffic engineering and network security improvements.

Computer Sciences

Bachelor of Science
Computer Science
Information Systems

Master of Science
Computer Information Systems
Computer Science

Doctor of Philosophy

Professors
Cem Kaner, Ph.D., *software engineering, software testing, computer law.*

J. Richard Newman, Ph.D., *software engineering, computer graphics, information resource management, multimedia distant learning, computer law and ethics.*

James A. Whittaker, Ph.D., *software testing, computer and information security, software reliability, software engineering.*

Associate Professors
Phil J. Bernhard, Ph.D., *database systems, software engineering.*

Walter P. Bond Jr., Ph.D., *software architecture and engineering processes, operating systems.*

Philip K. Chan, Ph.D., *scalable adaptive methods, machine learning, data mining, parallel and distributed computing, intelligent systems.*

Debasis Mitra, Ph.D., *artificial intelligence, spatial and temporal reasoning.*

William Shoaff, Ph.D., *computer graphics, analysis of algorithms, mathematical software.*

Ryan Stansifer, Ph.D., *programming languages, compilers, internationalization.*

Assistant Professors
Celine Alvey, D.P.A., *information systems.*

Mike M. Andrews, Ph.D., *software debugging techniques, software engineering.*

Ronaldo Menezes, Ph.D., *coordination systems, garbage collection, parallel computing, computation models, distributed computing.*

Marius Silaghi, Ph.D., *distributed problem solving and negotiation, asynchronous algorithms.*

Professors Emeriti
Frederick B. Buoni, Ph.D.; David R. Clutterham, Ph.D.

Adjunct Professors
A.A. Jorgensen, Ph.D.; V. Kovarik, Ph.D.

Lecturers
L. Bearden, M.S.; M. Mahoney, M.S.; H. Ray, M.B.A.

Student Coordinator
Rosalyn Bursey

Computer scientists are deeply involved in activities that are essential in our modern civilization. These activities include basic research, design, development and testing of software and information systems that serve society and its many needs. Computer technology is found in every aspect of today's world. Common uses include word processors, spreadsheets, computer games and entertainment, communications and information systems, transportation, education and training, medicine, criminology, factory automation, space exploration and assistive devices for the disabled. Computers have led to significant quality of life improvements, and yet their potential is still to be fully realized. Professionals in computer science design and develop computer systems that are, insofar as possible, free of defects and protected from misuse that would harm the health or welfare of society or the environment.

The mission of Florida Tech's computer sciences department is to pursue knowledge, truth and excellence in computer science, information systems and software engineering by nurturing student-centered academic programs characterized by shared values, unity of purpose, diversity of opinion, mutual respect and social responsibility. We are committed to expanding our range of disciplines through a well-funded and renowned research program, and to the continual improvement of the quality of our degree programs.

Bachelor of Science Degree Programs

The objectives of the computer sciences bachelor of science programs are to graduate students who have strong technical backgrounds in computer science, software engineering or information systems; who are good communicators and team members; who are able to develop and use a variety of systems and software applications; and who have positive attitudes toward the computing profession and a desire for lifelong learning.

The computer science curriculum at Florida Tech is a unique and well-rounded program that provides a solid technical background for careers in the computing profession or for graduate studies. Students can choose between either a traditional computer science program or an information systems program. Undergraduate students study the structure of typical computer systems, the techniques and theories supporting software development and specialized areas such as computer graphics, artificial intelligence, networks and information management. After graduation, they are equipped to enter the work force as systems analysts, application programmers or software specialists, and are provided with the background necessary for graduate study.

Because the subject matter of programming, algorithms and data structures forms a critically important foundation for all advanced computer science courses, the minimum grade for satisfying the prerequisite requirements for either program is a grade of C for each of the following courses: CSE 1001, CSE 1002 and CSE 2010.

Degree Requirements

Computer Science

The computer science program provides a traditional, yet innovative, preparation for those who are interested in careers in the computing industry or graduate study. Course work provides a broad theoretical foundation and the opportunity to study specialized topics in artificial intelligence, computer graphics, computer networks, databases, software design and testing, and other electives.

Students who select computer science must complete the following minimum course requirements:

Freshman Year

FALL	CREDITS
COM 1101 Composition and Rhetoric	3
CSE 1001 Fundamentals of Software Development 1	4
CSE 1101 Computing Disciplines and Careers 1	1
ECE 1551 Digital Logic	4
MTH 2051 Discrete Mathematics	3
	15

SPRING

COM	1102	Writing about Literature 3
CSE	1002	Fundamentals of Software Development 2 4
MTH	1001	Calculus 1 4
HUM	2510	Logic 3
		Restricted Elective (Science) 3
		17

Sophomore Year

FALL CREDITS

COM	2012	Research Sources and Systems 1
COM	2223	Scientific and Technical Communication 3
CSE	2010	Algorithms and Data Structures 4
MTH	1002	Calculus 2 4
PHY	1001	Physics 1 4
PHY	2091	Physics Lab 1 1
		17

SPRING

CSE	2050	Programming in a Second Language 3
CSE	2410	Introduction to Software Engineering 3
HUM	2051	Civilization 1 3
MTH	2401	Probability and Statistics 3
PHY	2002	Physics 2 4
PHY	2092	Physics Lab 2 1
		17

Junior Year

FALL CREDITS

CSE	3030	Legal, Ethical and Social Issues in Computing 3
CSE	3101	Machine and Assembly Language 3
CSE	4250	Programming Language Concepts 3
HUM	2052	Civilization 2 3
		Restricted Elective (Mathematics) 3
		15

SPRING

CSE	4001	Operating Systems Concepts 3
CSE	4083	Formal Languages and Automata Theory* 3
ECE	4551	Computer Architecture 3
		Liberal Arts Elective 3
		Restricted Elective (Science) 3
		Free Elective 3
		18

Senior Year

FALL CREDITS

CSE	4081	Introduction to Analysis of Algorithms* 3
CSE	4101	Computer Science Projects 1 3
		Restricted Elective (Computer Science) 3
		Social Science Elective 3
		Technical Elective or CWE 2001 3
		15

SPRING

CSE	4102	Computer Science Projects 2 3
		Humanities Elective 3
		Restricted Electives (Computer Science) 6
		Technical Elective 3
		15

TOTAL CREDITS REQUIRED 129

**One additional 3-credit Restricted Elective (Computer Science) may be taken in place of CSE 4081 or CSE 4083.*

Information Systems

The information systems program offers an interdisciplinary approach that bridges information systems, computing, business and communication disciplines to provide a solid foundation for effective management of today's complex systems. The study of information systems emphasizes strategic, managerial, operational and technical aspects of systems using appropriate decision tools, methods and technologies. Verbal and nonverbal communication modes are incorporated into the problem-solving process to promote the use of different information technologies, including multimedia, Web and distributed environments. There are also information systems programs offered by the School of Management. (See *School of Management* section in this catalog.)

Students who select information systems must complete the following minimum course requirements:

Freshman Year

FALL CREDITS

BUS	2303	Macroeconomics 3
COM	1101	Composition and Rhetoric 3
CSE	1000	Introduction to Information Systems 3
EDS	1031	Survey of Science 1 3
MTH	2051	Discrete Mathematics 3
		15

SPRING

BUS	2304	Microeconomics 3
COM	1102	Writing about Literature 3
CSE	1001	Fundamentals of Software Development 1 4
EDS	1032	Survey of Science 2 3
MTH	1001	Calculus 1 4
		17

Sophomore Year

FALL CREDITS

BUS	2201	Accounting Principles 1 3
BUS	2703	Statistics for Business 3
COM	2501	Introduction to Visual Communication 3
CSE	1002	Fundamentals of Software Development 2 4
MTH	1002	Calculus 2 4
		17

SPRING

BUS	2202	Accounting Principles 2 3
COM	2224	Business and Professional Writing 3
CSE	2010	Algorithms and Data Structures 4
HUM	2051	Civilization 1 3
		Social Science Elective 3
		16

Junior Year

FALL CREDITS

BUS	3401	Corporate Finance 3
BUS	3501	Management Principles 3
CSE	2050	Programming in a Second Language 3
CSE	2410	Introduction to Software Engineering 3
HUM	2052	Civilization 2 3
		15

SPRING

BUS	3503	Human Resource Management 3
BUS	3601	Marketing Principles 3
COM	4026	Publishing and the Internet 3
CSE	4020	Database Systems 3
CSE	4232	Computer Network Programming 3
		Humanities Elective 3
		18

Senior Year

FALL CREDITS

BUS	3704	Quantitative Methods 3
COM	3070	Professional Communication for Executives 3
CSE	3030	Legal, Ethical and Social Issues in Computing 3
CSE	4220	Systems Analysis and Design 3
CSE	xxxx	Restricted Elective (Computer Science) 3
		15

SPRING

COM	3440	Public Relations 3
COM	4424	Advanced Business and Professional Communication 3
CSE	4221	Systems Development Workshop 3
CSE	4410	Software Project Management 3
		Humanities Elective 3
		15

TOTAL CREDITS REQUIRED 128

Master of Science Degree Programs

Computer Information Systems

The Master of Science in Computer Information Systems is designed for students who seek a terminal degree that prepares them for positions in organizations that design, develop or utilize computer systems. It is for students who do not have bachelor's degrees in computer science but who wish to obtain advanced training in this field. Students with bachelor's degrees in computer science should apply for admission to the Master of Science in Computer Science degree program.

Admission Requirements

An applicant for the master's program in computer information systems is not required to have a bachelor's degree in computer science, but should have a mathematical background that includes differential and integral calculus, and those subjects included in the following courses:

CSE 5000 Introduction to Programming
CSE 5001 Assembly Language
MTH 2051 Discrete Mathematics

If the applicant's background is deemed deficient in any of these areas, admission may be granted with the stipulation that deficiencies be made up by taking the necessary extra courses. Students may elect to take MTH 5051, Applied Discrete Mathematics, for graduate credit instead of MTH 2051, for which graduate credit is not awarded. Graduate Record Examination scores (General Test only) are required.

Degree Requirements

The Master of Science in Computer Information Systems requires a minimum of 30 credit hours, as follows:

CSE 5100 Data Structures and Algorithms 3
CSE 5230 Operating Systems 1 3
CSE 5250 Programming Languages 3
ECE 5536 Computer Hardware Design 3
Electives (at least 12 credits in Computer Science) 18

A student who can verify competence in any required course may substitute an appropriate course with the permission of the student's adviser and department head. All electives that apply to the degree must be similarly approved. The computer science office maintains a list of approved courses from which electives can be selected.

All students must pass a final program examination. The examination is offered each fall and spring semester and may be taken no earlier than the last semester in which the student is registered for courses. The examination may be retaken in accordance with Graduate School policy.

Computer Science

This program offers a student the opportunity to pursue advanced studies in various areas of computer science. The program is designed for students with bachelor's degrees in computer science and provides a solid preparation for those who may pursue a doctorate.

Admission Requirements

Applicants must have taken courses equivalent to the four required courses in the Master of Science in Computer Information Systems (CIS) degree program, in addition to meeting the admission requirements listed for the CIS program.

If the applicant's background is deemed deficient in any of the listed areas, admission may be granted with the stipulation that deficiencies are made up by taking the necessary extra courses. Graduate Record Examination scores (General Test only) are required.

Degree Requirements

The Master of Science in Computer Science requires a minimum of 32 credit hours. Students are encouraged to complete and successfully defend a thesis. Students who decide not to write a thesis must pass a comprehensive examination given in the last semester in which the student is registered for courses.

To ensure students are exposed to a variety of areas in computer science, they must pass one course in each of three categories: applied software, foundations, and software and systems, as listed below:

Applied Software
CSE 5260 Database Systems
CSE 5280 Computer Graphics
CSE 5290 Artificial Intelligence

Foundations
CSE 5210 Formal Languages and Automata Theory
CSE 5211 Analysis of Algorithms

Software and Systems
CSE 5231 Computer Networks
CSE 5251 Compiler Theory and Design
SWE 5001 Software Engineering 1

Students are exempted from this breadth requirement only if they can show evidence that they have passed courses equivalent to all of those on the category lists. A listed course can be replaced by another appropriate course only with permission of the student's adviser and department head.

The other course requirements are:

MTH 5051 Applied Discrete Mathematics 3
CSE 5500 Computer Science Seminar 2
Electives (at least 6 credits must be in Computer Science, numbered CSE 5600 or higher) 12
CSE 5999 Thesis in Computer Science or Advanced Electives (CSE 5600 or higher) 6

All electives that apply to the program must be approved by the student's adviser. The computer science office maintains an approved set of courses, including courses in other disciplines, from which electives can be selected. At most, six approved elective credits can be from other disciplines.

Doctor of Philosophy Degree Program

The doctoral program is designed to provide the highest level of academic study and research in the disciplines of computer science. The goal is to produce qualified professionals for teaching and research positions in the academic world, as well as equivalent positions in industry and government. The demand for these qualified professionals continues to far exceed the current production and is expected to remain so for the foreseeable future.

The doctoral program in computer science is designed to attract students with the greatest potential for expanding the frontiers of knowledge and transferring this knowledge to others. The program requires a significant breadth of understanding in the fundamentals of computer science, the

mastery of several specialized subjects and the creativity to extend the body of knowledge on a particular subject through significant original research.

Admission Requirements

Each potential candidate must meet the general admission requirements and follow the process for applying, which is presented in the *Graduate Information and Regulations* section of this catalog.

To qualify for admission to the doctoral program in computer science, a candidate must demonstrate the potential for success in this program. A student may do so by one of the following means:

1. Successful completion of a bachelor of science degree in computer science from an accredited institution, with a GPA of at least 3.5.
2. Successful completion of a master of science degree in computer science or a related field from another accredited institution, with a GPA of at least 3.3.
3. Successful completion of 15 credits of advanced graduate course work at Florida Tech in the Master of Science in Computer Science program with a cumulative grade point average of at least 3.3.

Also required are three letters recommending doctoral study from individuals familiar with the student's academic and research ability, and scores from the Graduate Record Examination General Test and Subject Test in Computer Science.

Degree Requirements

The degree of doctor of philosophy is conferred in recognition of both breadth of scientific competence in computer science and technical research capabilities, as demonstrated by producing an acceptable dissertation. The required work consists of advanced studies in preparation for specialized research, and preparation and completion of an original research program resulting in a significant contribution to the body of knowledge in the subject investigated. Each student must qualify for admission, complete an approved program of study, pass a comprehensive examination, complete a program of significant original research and prepare and defend a dissertation concerning the research.

Each candidate is expected to publish major portions of the dissertation in refereed conferences and journals, and is strongly encouraged to teach while pursuing the degree. General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

The minimum course work requirement is 56 credits beyond the bachelor's degree, including at least 21 credits in courses numbered CSE 5600 or higher. The minimum research and dissertation requirement is 24 credits beyond the master's degree or 30 credits if the student did not complete a master's thesis; of these, at least 15 credits must be dissertation.

During the first or second term, a doctoral student must prepare a program of study to be approved by the student's faculty adviser and department head. The program of study should be designed to fit the student's professional goals, the department's resources and the breadth of general computer science knowledge expected of all doctoral candidates, and should identify a major concentration.

Each student is required to pass comprehensive examinations that cover breadth and depth within computer science. The breadth examination is administered by computer science faculty and normally must be taken before the end of two years from admission into the doctoral program. This examination includes topics from the foundations of computer science, computer systems, computer software and applied software. After completion of all course work contained in the approved program of study, the student is required to pass a depth examination administered by his or her doctoral committee. Detailed information on the comprehensive examination is available to students in the department office.

After passing the comprehensive examination, the student prepares a dissertation proposal representing the research plan to be followed. The dissertation research is carried out under close supervision of the student's doctoral adviser. After completion of the research project and approval of the adviser, the dissertation is submitted to the doctoral committee for critical evaluation, followed by an oral defense of the dissertation.

Research Activities

The computer sciences faculty are currently conducting research in the following general areas:

Intelligence Systems

- Data mining and knowledge discovery
- Expert systems
- Model-based reasoning
- Parallel and distributed intelligent systems
- Scalable machine learning with multiple models
- Search algorithms
- Spatio-temporal and constraint reasoning

Software and Hardware Systems

- Computer graphics
- Coordination systems
- Distributed database systems
- High-performance computing and systems
- Internationalization
- Parallel processing
- Programming languages

Laboratory Facilities

A wide array of computer hardware and software is provided to support instruction and research. Continual system upgrades and enhancements allow us to offer up-to-date computing resources. Facilities include networks of IBM, Silicon Graphics and Sun workstations, as well as Pentium PC networks. Instructional classrooms are used to support teaching, and research laboratories are available for advanced studies.

Electrical Engineering

Bachelor of Science *Master of Science* *Doctor of Philosophy*

Areas of Specialization:
Electromagnetics
Physical Electronics
Systems and Information Processing
Wireless Systems and Technology

Professors

Barry G. Grossman, Ph.D., *fiber-optic sensor systems and smart structures, fiber-optic communications, optical computing and signal processing, neural network image and signal processing, acoustooptic and electrooptic devices.*

John Hadjilogiou, Ph.D., *switching theory, computer organization and architecture, fault diagnosis, reliable design.*

Fredric M. Ham, Ph.D., Harris Professor, *linear and nonlinear control systems, optimal control systems, optimal estimation, digital signal processing, system modeling, bio-medical engineering, neural networks.*

Samuel P. Kozaitis, Ph.D., *automated feature extraction, optical pattern recognition, image processing.*

Walter M. Nunn Jr., Ph.D., *electromagnetic theory, microwave electronics, antennas, electromagnetic radiation.*

Thomas J. Sanders, Ph.D., Harris Professor, *solid-state devices, integrated circuits, design and fabrication, manufacturing and reliability.*

Robert Sullivan, Ph.D., *power systems, power electronics.*

Lynn Edward Weaver, Ph.D., *nuclear energy, control systems.*

Joseph C. Wheeler, Ph.D., *computer-processing algorithms, geophysical data, infrasonic and seismic sensors.*

Visiting Professors

Philip S. DiPiazza, Ph.D., *wireless multimedia communication.*

Kenneth A. Ports, Ph.D., *semiconductor and microelectronic technology, radiation effects in semiconductors, nanotechnology.*

Associate Professors

Rufus H. Cofer Jr., Ph.D., *image processing, pattern recognition, radar signal processing, fault-tolerant computing.*

Raghvendra Deshmukh, Ph.D., *electronic circuits, digital systems, high-performance computer architecture, microprocessor applications, parallel processing.*

Syed H. Murshid, Ph.D., *photonics, fiber-optic sensors, acoustic and fiber-optic communications, power electronics, instrumentation.*

John S. Seybold, Ph.D., *communication systems, spread-spectrum communications, wireless systems, radar digital signal processing.*

M. Mehdi Shahsavari, Ph.D., *wireless networking, computer networks, telecommunications, development of secure distributed applications over the Internet, intrusion detection, component-based network management.*

Professors Emeriti

Charles D. Beach, Ph.D.; Andrew W. Revay, Ph.D.;
Lynn E. Weaver, Ph.D.

Adjunct Professors

F.M. Caimi, Ph.D.; T. Crandell, Ph.D.; E. Hines, Ph.D.;
P.M. Julich, Ph.D.; B.A. Myers, Ph.D.; J.K. Roach, Ph.D.;
C. Zahm, Ph.D.

Lecturer

W.C. Andrew Groome, M.S.

Student Coordinator

Sybil Snider

Bachelor of Science Degree Program

The goal of the electrical engineering program is to provide the student with a total learning experience. It is designed to expose the entire spectrum of electrical engineering concepts from the basic building blocks of transistors and gates, through communications, control, electromagnetic, computer and photonic systems. Students develop an extensive knowledge of hardware, along with skills in software simulation and analysis. In the senior year, students design, build and test "complete systems" as part of their senior design course.

The mission of the electrical and computer engineering department is to provide a top quality, state-of-the-art education to our graduates; to perform interdisciplinary research focusing on the needs of industry and government partners; and to provide technical and professional services to our local, state, national and international constituencies.

The program objective for electrical engineering is to produce engineers with significant professional credentials. They will possess a fundamental knowledge and understanding of the mathematics and science applicable to electrical engineering, and will routinely demonstrate the ability to competently apply their knowledge to produce effective engineering solutions. Our graduates have experience in the use of modern tools for design, synthesis and analysis of contemporary engineering challenges, and can integrate hardware and software. They exhibit ehical conduct and sensitivity to contemporary social issues. Able to function well on multidisciplinary teams, our graduates communicate effectively and engage in lifelong learning and continuous professional development.

A major component of the electrical engineering program at Florida Tech involves hands-on learning. The electrical engineering student begins taking electrical engineering courses during his/her freshman year. The freshman-level courses include building and testing an actual computer board for subsequent expansion, followed by courses in which students build "add-on" boards for signal acquisition, generation and analysis, as well as the software needed to operate the boards. Laboratory experience and computer-based analysis are integrated into most classes and all laboratories.

In electrical engineering, a strong emphasis is on the mastery principle. It is assured that electrical engineering students not only know the material critical to engineering, but that they can demonstrate mastery of the material, which is the goal of everyone in the program.

The information explosion via the Internet is so important to the future conduct of business in the technology industry that the curriculum includes almost daily interaction of the student with the Internet. This includes the collection of information from other universities and the use of the Internet as a teaching and research aid and guide to the learning experience.

During the freshman and sophomore years, students learn the basics of electrical engineering along with college-level mathematics and physics. In addition, courses in computer design with hands-on lab experiences are taken both terms of the freshman year.

Throughout the sophomore and junior years, students learn the basic analytical techniques of engineering—ways in which the engineer views physical situations and uses mathematical techniques to design basic subsystems. Many of the courses taken by students at this level offer integrated lab experiences. In this way, students can visualize the practical aspects of various electronic theories they encounter.

During the senior year, students take courses that allow them to use previous knowledge to develop a systems approach to engineering design. They gain a deeper knowledge in at least two specializations through combination lecture/laboratory courses, followed by advanced courses in related areas. Through electives, students may explore various topics within electrical engineering for which they have developed specific interests.

Degree Requirements

Candidates for the Bachelor of Science in Electrical Engineering must complete the minimum course requirements as outlined in the following full-time curriculum. Deviation from the recommended program may be made only within the Accreditation Board for Engineering and Technology (ABET) guidelines, upon the approval of the student's adviser and concurrence of the department head. Students may complete these requirements on a part-time basis.

Proficiency in certain key areas is of primary importance to success as electrical engineers. For this reason, a student who receives a grade of D in any of the following courses is strongly urged to repeat the course to attain a grade of at least C: MTH 1001, MTH 1002, MTH 2001, MTH 2201; PHY 1001, PHY 2002, PHY 2003; ECE 2111, ECE 2112, ECE 3111, ECE 3222, ECE 3442.

Students are required to have successfully completed a minimum of 90 percent of all the courses listed below under the freshman and sophomore years before being allowed to register for upper-level (3000/4000) courses.

Students who have completed 24 credit hours and have not passed COM 1101 will register for this course in the next available semester. Students who have completed 48 credit hours and have not passed COM 1102 will register for this course in the next available semester.

The engineering science elective is limited to courses that help develop an appreciation of other branches of engineering. Courses that are acceptable as humanities/social science electives are identified as such in the *Course Descriptions* section of this catalog. Definitions of electives for engineering programs are presented in the *Undergraduate Information and Regulations* section of this catalog.

Additional policies and procedures governing degree requirements may be found in the program's student handbook and "Databus."

Freshman Year

FALL		CREDITS
CHM 1101	General Chemistry 1	4
COM 1101	Composition and Rhetoric	3
ECE 1551	Digital Logic	4
MTH 1001	Calculus 1	4
		15

SPRING		
COM 1102	Writing about Literature	3
ECE 1552	Computer Design	4
MTH 1002	Calculus 2	4
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
		16

Sophomore Year

FALL		CREDITS
ECE 2111	Circuit Theory 1	4
ECE 2551	Software/Hardware Design	3
MTH 2201	Differential Equations/Linear Algebra	4
PHY 2002	Physics 2	4
		15

SPRING		
ECE 2112	Circuit Theory 2	4
HUM 2051	Civilization 1	3
MTH 2001	Calculus 3	4
MTH 2401	Probability and Statistics	3
PHY 2003	Modern Physics	3
		17

Junior Year

FALL		CREDITS
ECE 3111	Electronics	4
ECE 3222	Signals and Systems	3
ECE 3331	Electron Devices	3
ECE 3442	Electromagnetic Waves	3
HUM 2052	Civilization 2	3
		16

SPRING		
ECE 3240	Junior Design	1
ECE 3551	Microcomputer Systems 1	4
ECE 4221	Communication Systems	3
ECE 4231	Control Systems	3
ECE 4332	Electrooptic Devices and Systems	3
	Humanities Elective	3
		17

Senior Year

FALL		CREDITS
ECE 4241	Systems Design 1	3
	Restricted Elective* (Electrical Engineering)	6
	Free Elective	3
	Engineering Science Elective**	3
	Social Science Elective	3
		18

SPRING		
ECE 4242	Systems Design 2	3
	Humanities/Social Science Elective	3
	Restricted Elective (COM)	3
	Technical Elective	6
		15

TOTAL CREDITS REQUIRED 129

**The Electrical Engineering Restricted Electives must be selected from the following:*

ECE 4224 Communications and Control Lab
ECE 4311 Microelectronic Fabrication Lab
ECE 4330 Integrated Circuit Design and Layout Lab
ECE 4442 Microwave Lab

***The Engineering Science Elective must be one of the following:*

CHE 3260 Materials Science and Engineering
MAE 2081 Applied Mechanics: Statics
MAE 2082 Applied Mechanics: Dynamics
MAE 3083 Mechanics of Materials
MAE 3191 Engineering Thermodynamics 1

Master of Science Degree Program

All master of science areas of specialization can be taken on either a full-time or part-time basis. A two-year projection of course offerings is available on request. Course offerings are arranged to permit the master's program to be completed in three semesters for full-time students and in two calendar years for part-time students.

Admission Requirements

The undergraduate backgrounds of applicants for admission to the master's degree programs vary considerably. An applicant from a U.S. school should have a bachelor of science or equivalent degree from an electrical engineering program accredited by the Accreditation Board for Engineering and Technology (ABET). In evaluating an international application, consideration is given to academic standards of the school attended and the content of the courses leading to the degree obtained.

Applicants whose bachelor's degrees are in other engineering fields, mathematics, or the physical sciences may be accepted, but will be required to remedy any deficiencies by satisfactorily completing a number of undergraduate courses in preparation for graduate study in electrical engineering.

Degree Requirements

The Master of Science in Electrical Engineering is offered with four possible fields of specialization and both thesis and nonthesis degree paths. Each specialization requires a minimum of 30 credit hours of approved graduate study; however, within each specialization, course choices vary considerably. Prior to the completion of nine credit hours, a student must submit for approval a master's degree program plan to indicate the specialization and path chosen and the specific courses to be taken. Up to six credit hours of thesis may be included in the 30-credit-hour requirement. A nonthesis candidate must pass a master's final program examination.

Curriculum

Listed below are required and elective courses for the master of science specializations.

Electromagnetics Specialization

ECE 5425 Antennas 1 3
ECE 5426 Antennas 2 3
either
ECE 5410 Electrodynamics 1 3
ECE 5411 Electrodynamics 2 3
or
ECE 5418 Field Theory of Guided Waves 1 3
ECE 5419 Field Theory of Guided Waves 2 3
Approved electives, which may include 6 credits of thesis 18
TOTAL CREDITS REQUIRED 30

Physical Electronics Specialization

This specialization is the combination of two interrelated sub-options—microelectronics and photonics. Recent advances in electronic systems have been largely due to the development of integrated circuits, lasers, optical computing and signal processing, as well as fiber-optic communication and sensing. The study and research of these advanced devices and systems comprise the direction of this program.

Microelectronics Sub-option Requirements

Three courses from the microelectronics course list (must include ECE 5301) 9
One course from the photonics course list (ECE 5350, ECE 5351 are recommended) 3
Two courses from the mathematics course list 6
Approved electives (may include 6 credits of thesis) 12
TOTAL CREDITS REQUIRED 30

Photonics Sub-option Requirements

Four courses from the photonics course list (must include ECE 5350 or ECE 5351) 12
One course from the microelectronics course list (ECE 5301 is recommended) 3
Two courses from the mathematics course list 6
Approved electives (may include 6 credits of thesis) 9
TOTAL CREDITS REQUIRED 30

Microelectronics

ECE 5301 Semiconductor Device Theory
ECE 5310 VLSI Processing
ECE 5311 Microelectronics Fabrication Lab
ECE 5333 Analog IC Design
ECE 5335 Advanced IC Design and Simulation
ECE 6301 Advanced Semiconductor Device Theory

Photonics

ECE 5350 Optical Electronics
ECE 5351 Fiber-Optic Communication Systems
ECE 5352 Fiber-Optic Sensor Systems
ECE 5353 Optical Computing
ECE 5354 Acoustooptic and Electrooptic Devices
ECE 5355 Electrooptics Lab
ECE 5356 Optical Waveguides and Devices
ECE 5418 Field Theory of Guided Waves 1

Mathematics

MTH 5201 Mathematical Methods in Science and Engineering 1
MTH 5202 Mathematical Methods in Science and Engineering 2
MTH 5301 Numerical Analysis
MTH 5315 Numerical Methods for Partial Differential Equations
MTH 5401 Applied Statistical Analysis

Systems and Information Processing Specialization

ECE 5201 Linear Systems 1 3
ECE 5234 Communication Theory 3
or
ECE 5223 Digital Communications 3
ECE 5245 Digital Signal Processing 1 3
MTH 5425 Theory of Stochastic Signals 3
Mathematics Elective 3
Approved electives, including 0-6 thesis credits 15
TOTAL CREDITS REQUIRED 30

Within this area of specialization, courses may be selected to allow concentrations in areas that include systems, digital signal and image processing, neural networks and controls. Each student plans a program of study in consultation with a member of the faculty whose professional field is related to the student's interest.

Wireless Systems and Technology Specialization

The explosive growth of cellular phones and systems has prompted the notion that "wireless" is synonymous with pocket phones and pagers. Wireless in the context of this specialization refers to any system or device that relies on electromagnetic-wave propagation to perform one or more of its functions, including such diverse applications as radar, global positioning, location, sensing, etc., as well as the broader class of communications systems such as satellites, point-to-point/multipoint, WLAN, Wireless WAN, etc. This specialization provides students with a solid foundation in the broad array of disciplines that are common and

fundamental to these disparate applications, while allowing flexibility to delve into specific application areas of interest. The core curriculum also emphasizes the fundamental theory and principles, system elements and techniques that are common to all these applications. The goal is to ensure that graduates are prepared to make immediate contributions professionally or to pursue more advanced studies in their specific areas of interest.

Wireless Systems Sub-option Requirements

All courses from the core curriculum list	15
Three courses from the wireless systems list	9
Approved electives (or thesis)	6
TOTAL CREDITS REQUIRED	30

Microwave Engineering Sub-option Requirements

All courses from the core curriculum list	15
Three courses from the microwave engineering list	9
Approved electives (or thesis)	6
TOTAL CREDITS REQUIRED	30

Core Curriculum

ECE 5111 Radio Frequency Propagation
ECE 5201 Linear Systems 1
ECE 5234 Communication Theory
ECE 5245 Digital Signal Processing 1
MTH 5425 Theory of Stochastic Signals

Wireless Systems

ECE 5112 Introduction to Wireless Systems and Applications
ECE 5113 Wireless Local Area Networks
ECE 5114 Radio Location, Sensing and Measurement
ECE 5221 Personal Communications Systems
ECE 5223 Digital Communications
ECE 5233 Satellite Communications
ECE 5238 Error Control Coding
ECE 5246 Digital Signal Processing 2
ECE 5251 Radar Systems

Microwave Engineering

ECE 5115 Modern Wireless System Design
ECE 5356 Optical Waveguides and Devices
ECE 5418 Field Theory of Guided Waves 1
ECE 5425 Antennas 1
ECE 5426 Antennas 2
ECE 5450 Automated RF Measurements
ECE 5451 Microwave Circuit Design

Program for Graduates from Other Fields

A student admitted to this program is expected to have a bachelor's degree from a regionally accredited institution or the equivalent, with an undergraduate major in an engineering discipline, mathematics or the physical sciences, and an academic and/or professional record indicating a high probability of success in graduate work. Preparatory courses required to provide a student with the background necessary for successful graduate study are listed below for each specialization. Depending on the individual's background, other courses (e.g., differential equations and linear algebra) may also be required. Proficiency in these areas may be demonstrated by either successful course completion or by passing an equivalency examination. When possible, a student will be notified of deficiencies at the time of acceptance. In addition to the preparatory work described, all degree requirements listed above for one of the master of science specializations must be fulfilled.

Electromagnetics Specialization

ECE 2112 Circuit Theory 2
ECE 3111 Electronics
ECE 3222 Signals and Systems
ECE 3331 Electron Devices
ECE 3442 Electromagnetic Waves

Physical Electronics Specialization

ECE 2112 Circuit Theory 2
ECE 3111 Electronics
ECE 3222 Signals and Systems
ECE 3331 Electron Devices
ECE 3442 Electromagnetic Waves (Photonics Option)
ECE 4332 Electrooptic Devices and Systems

Systems and Information Processing Specialization

ECE 1552 Computer Design
ECE 2112 Circuit Theory 2
ECE 3111 Electronics
ECE 3222 Signals and Systems
ECE 4221 Communication Systems
ECE 4231 Control Systems

Wireless Systems and Technology Specialization

ECE 2112 Circuit Theory 2
ECE 3111 Electronics
ECE 3222 Signals and Systems
ECE 3442 Electromagnetic Waves
ECE 4221 Communications Systems
MTH 2401 Probability and Statistics

Doctor of Philosophy Degree Program

Admission Requirements

Admission to doctoral study is granted to a limited number of applicants who have received master's degrees in electrical engineering or related fields from accredited institutions or from international institutions that provide suitable preparation for doctoral-level studies.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The degree of doctor of philosophy is conferred primarily in recognition of breadth of creative accomplishment and ability to investigate scientific or engineering problems independently, rather than for completion of a definite course of study. The work should consist of advanced studies and research leading to a significant contribution in the field of specialization.

The doctoral program in electrical engineering may be completed with a minimum of 48 credit hours beyond the master's degree; however, typically 48 to 54 credit hours are necessary. Each student must pass the preliminary written examination; complete an approved program of study beyond that required for a master's degree; pass the comprehensive written examination; complete a program of significant original research; and prepare and defend a dissertation concerning the research.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

COURSE WORK AND THESIS SUMMARY	CREDITS
Doctoral course work minimum beyond master's degree	24
Doctoral research and dissertation	24
TOTAL MINIMUM BEYOND THE MASTER'S DEGREE	48

To assure that all graduates of the doctoral program possess a body of common knowledge, certain courses in electrical engineering and related areas are required. If, in the judgment of the electrical engineering graduate faculty, a student has acquired the equivalent knowledge of a particular subject during previous graduate study at another institution, the

student will not be required to take the course at Florida Tech. The requirements depend on the student's chosen area of concentration, as described below.

Electromagnetics
The student's master's and doctoral course work combined should include 30 credits in electrical engineering and six credits in physics, as follows:
ECE 5410 Electrodynamics 1
ECE 5411 Electrodynamics 2
ECE 5418 Field Theory of Guided Waves 1
ECE 5419 Field Theory of Guided Waves 2
ECE 5425 Antennas 1
ECE 5426 Antennas 2
ECE 5430 Electromagnetic Tensor Green Functions
ECE 5431 Computational Electromagnetics
ECE 5450 Automated RF Measurements
ECE 5451 Microwave Circuit Design
PHY 5030 Quantum Mechanics 1
PHY 5031 Quantum Mechanics 2

Physical Electronics
The student's master's and doctoral course work combined should include a minimum of 21 credits in electrical engineering, nine credits in physics and nine credits in mathematics, including all courses required in the master's suboption corresponding to the desired area of specialization.

Systems and Information Processing
The student's master's and doctoral course work combined should include a minimum of 24 credits in electrical engineering and 12 credits in mathematics, including the courses listed under one of the following areas of specialization:

Control
ECE 5202 Linear Systems 2
ECE 5231 Optimal Systems
ECE 5243 Digital Control Systems
MTH 5425 Theory of Stochastic Signals

Signal Processing
ECE 5245 Digital Signal Processing 1
ECE 5246 Digital Signal Processing 2
ECE 5256 Digital Image Processing
MTH 5425 Theory of Stochastic Signals

Wireless Systems and Technology
The student's masters and doctoral course work combined should include all courses in the master's degree core curriculum for this specialization, plus nine additional credits in mathematics and all courses listed under one of the following doctoral specialization areas.

Wireless Systems
ECE 5202 Linear Systems 2
ECE 5223 Digital Communications
ECE 5238 Error Control Coding
ECE 5246 Digital Signal Processing 2

Microwave Engineering
ECE 5418 Field Theory of Guided Waves 1
ECE 5425 Antennas 1
ECE 5450 Automated RF Measurements
ECE 5451 Microwave Circuit Design

Research Facilities

The electrical and computer engineering programs conduct research in all of the listed areas of specialization. This research is funded by both government and industrial sources, including DARPA, Rome Laboratory, U.S. Air Force, U.S. Army, NSF, the Semiconductor Research Corporation, Harris Corporation, Grumman, Lockheed, MITRE Corporation and the state of Florida.

The research facilities include more than 7,000 square feet of well-equipped laboratories. Although these facilities are utilized principally for theoretical and experimental engineering research and development by graduate students and faculty, they are also available to undergraduate students for experimental investigations to supplement theoretical lecture courses. Central computer resources of the university include Harris Night Hawk and VAX 8350. A network of 16 advanced Sun and 15 PC workstations is available to assist research in the following laboratories.

Applied Perception Laboratory
Perception involves all processes leading up to the characterization of objects and processes within the perception field; 70 percent of the human brain is devoted to the task. Research in automated perception includes object detection and perception, segmentation, texture analysis, noise reduction, edge detection, computer imaging, modeling and other areas of image analysis. Techniques used include wavelets, fractals, higher-order statistics and morphology. Image processing is usually done on digital computers but sometimes is performed by special optoelectronic devices. Application areas include autonomous inspection in manufacturing and other commercial uses, the analysis and interpolation of infrared or synthetic aperture radar (SAR) imagery and the extraction of cartographic features from overhead imagery. Technologies studied include imagery chains, enhancement, compression, restoration, feature extraction and pattern recognition.

Information Processing Laboratory
The Information Processing Laboratory (IPL) was established in 1989 to conduct research concerned with problems in the areas of signal processing, neural networks and biomedical engineering. In signal processing, algorithms have been developed for near-real-time detection and classification of nuclear explosions for purposes of monitoring nuclear testing. Other work includes the development of high-speed n-dimensional discrete convolution algorithms based on matrix Kronecker products. In neural networks, new neural architectures and robust learning rules have been developed. Neural networks have been designed to solve engineering problems (e.g., determining concentrations of glucose from near infrared spectra of human blood serum). Biomedical engineering research includes biosensor development for a noninvasive blood glucose monitoring system for diabetics. A signal discriminator has been developed based on partial least-squares for classifying electroencephalograph signals. This system is being developed to provide a means of communication for individuals who have lost their ability to speak. The IPL is equipped with a network of three DEC-Alpha workstations and six PCs, and an optical test-bed for biosensor development.

Integrated Circuit Research and Development
Laboratories are dedicated to the design, layout and test of a variety of CMOS and bipolar integrated circuit technologies. The design and layout capability consists of a laboratory with 12 Sun workstations running sophisticated software, including SPICE for circuit simulation and MAGIC for circuit layout. In the course environment, students develop circuits for fabrication through the MOSIS service. Integrated circuit tests are performed in a number of laboratories, including

the microelectronics facility. Research has been extended to studies of integrating sensors into silicon chips, enhancing the radiation tolerance of silicon technologies, and developing microwave modules using hybrid ceramic techniques.

Laser and Optronics Laboratory

This laboratory is dedicated to research and development efforts in the field of optical electronics. Research is primarily focused in the areas of optical communications and optical sensors, ranging from development of state of the art optical transmission media and techniques to design and development of cryogenic instrumentation for the space program.

Lightwave Research Laboratory

This laboratory is designed to accommodate the needs of faculty and student researchers advancing the state of the art in fiberoptic devices and systems for communication and sensing applications. Research performed includes development of unique fiberoptic devices and techniques that allow communications channels to operate with expanded bit rates, and encryption and sensors to measure multiple parameters in structures and the environment. Instruments include data processing systems for data acquisition and signal processing, optical time domain reflectometers, laser microscopes, fiber amplifiers, Bit Error Rate (BER) test equipment, lasers, transmitters and receivers, optics benches, couplers, splitters, attenuators and other fiberoptic components.

Microelectronics

The microelectronics facility is designed to be a teaching laboratory as well as an advanced research laboratory. Research conducted in the facility includes advanced microelectronic packaging and processes for new metallization and dielectrics. The facility is a 3,800-square-foot structure with all support services needed for modern semiconductor research. There is a 3,000-square-foot cleanroom as well as areas dedicated to integrated circuit testing and equipment maintenance. Equipment in the teaching laboratory includes photolithographic aligners, diffusion furnaces, a thin film evaporator, wet chemistry benches and significant measurement and inspection equipment. The advanced research laboratory features a scanning electron microscope, rapid thermal annealer and dry-etch equipment. Additional equipment will be added as research programs develop. The facility also hosts a microelectronics fabrication course, taught to both graduates and undergraduates, in which students completely fabricate and test state of the art integrated circuits.

Microwave Laboratory

The Microwave Laboratory is equipped with instrumentation for precision electromagnetic measurements up to 20 GHz, including electron-beam and solid-state microwave amplifiers, oscillators and mixers, spectrum analyzers, analog and digital storage scopes, high-frequency and coaxial transmission lines, waveguides and associated electronics.

Network Communications Laboratory (NetLab)

This laboratory serves the needs of the Center for Computing and Communications addressing topics in high-performance computers and communications, server and router load balancing, multimedia over the Internet, Multi-Protocol Label Switching (MPLS) and firewall design issues with emphasis on computer security and the protection of computer-related assets. A component-based, distributed network management framework is being developed that provides reliability, flexibility, scalability, policy-based intrusion detection, automatic patch updates, and efficiency through plug-and-play of management components. Java and CORBA as well as portable C++ are used to provide mobile code capability and location transparency.

Wireless Center of Excellence (WiCE) Laboratory

The WiCE Lab is equipped to support a wide variety of activities including simulation, fabrication (in conjunction with the Microelectronics Laboratory) and measurement of wireless communications and other systems and components. Current software/simulation tools include HFSS, ADS, and MDS and Sun UltraSPARC workstations. Test equipment includes a spectrum analyzer, vector network analyzer, oscilloscopes, microwave amplifiers, oscillators and mixers, signal generators, and associated active and passive RF devices. Experimental facilities include two anechoic chamber rooms, an azimuth positioner, a digital pattern recorder for antenna pattern measurements and a screen room for facilitating "quiet" RF measurements.

Engineering Management

ENGINEERING MANAGEMENT PROGRAM
M.A. Shaikh, Ph.D., Director

Master of Science

Professors
Muzaffar A. Shaikh, Ph.D., *management science and decision modeling.*

Wade H. Shaw Jr., Ph.D., P.E., *simulation, modeling, information systems and quality.*

Doherty Visiting Professor
Joseph A. Angelo, Ph.D., *environmental science.*

Professor Emeritus
Frederick B. Buoni, Ph.D.

Adjunct Professors
C.A. D'cruz, D.Eng.; D.W. Fisher, J.D., P.E.

Master of Science Degree Program

The Master of Science in Engineering Management has been developed to meet the professional needs of the engineer who, although working in a technical field, finds it necessary to update his or her skills in engineering, as well as acquire knowledge in the management of engineering. Typically, the technical person finds that as he or she advances in the chosen field, the challenges of management increase as part of the overall responsibilities of the position. Many find that their careers would best be served by a program addressing both areas of their job responsibilities. This program is designed for those individuals.

The master of science program in engineering management is an interdisciplinary program administered by the College of Engineering and offered in cooperation with the School of Management. The program faculty includes specialists in engineering management, as well as coordinators of the specialization areas.

Admission Requirements

An applicant for the master's program in engineering management should have a bachelor's degree from an ABET-accredited engineering program. Applicants with bachelor's degrees in physical sciences, computer science and mathematics will also be considered. In evaluating an international application, consideration is given to the academic standards of the school attended and the content of the courses. Letters of recommendation and a statement of educational objectives reflecting the applicant's professional experience and career goals are also encouraged. Applicants should also take the Graduate Record Examination (GRE).

General admission requirements and the process for applying are discussed in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The master of science degree requires a minimum of 36 credit hours. Courses taken to satisfy admission prerequisites cannot be counted toward the degree requirements. Students without adequate undergraduate courses in accounting, statistics, computer applications and economics will be required to make up these deficiencies. Applicants whose bachelor's degrees are not in engineering will also be required to remedy any additional deficiencies by satisfactorily completing a number of undergraduate courses selected to meet the prerequisites for graduate study in their engineering area of specialization.

Curriculum

The program requires six courses from the management area and six courses from the engineering area. At least four courses should be taken from the engineering management (ENM) list and can be applied toward either the management or engineering requirement.

Management

Six courses with a clear focus on management are required. These courses may be from the foundation, core or elective courses offered by the School of Management or from courses with a management emphasis from other academic units in the university. Each student meets with the engineering management program director and faculty with expertise in the field of management to select the six-course management sequence. A student must meet any prerequisites needed for a graduate course in management that may be required by the academic unit that offers the course.

Engineering

An engineering specialization is taken by every student based on his or her need for graduate education in technology. A specialization track can be drawn from any of the programs within the College of Engineering or closely allied disciplines such as mathematics or operations research. Each student meets with the engineering management program chair and faculty familiar with the area of technical emphasis to form a sequence of five courses. A student must meet any prerequisites listed for a graduate engineering course.

A student may complete an internship with an industrial, government or service organization, or elect to prepare and defend a thesis to account for up to six semester hours of the 36 credits required for graduation. In order to meet graduation requirements, a nonthesis student must present a portfolio of competencies and a summary of the career relevance of his or her academic study.

DEPARTMENT OF MARINE AND ENVIRONMENTAL SYSTEMS
G.A. Maul, Ph.D., Head

Environmental Sciences

Bachelor of Science
Options in:
Environmental Science
Meteorology

Master of Science
Environmental Resource Management
Environmental Science
Meteorology

Doctor of Philosophy

Program Chair
John G. Windsor, Ph.D.

Professors
Thomas V. Belanger, Ph.D., *environmental planning, freshwater ecology, chemistry and biology of natural waters, wastewater treatment, water resources.*

Iver W. Duedall, Ph.D., *environmental chemistry, geochemistry, marine pollution processes, physical chemistry of natural waters, waste management, global environmental issues, hurricanes.*

George A. Maul, Ph.D., *marine meteorology, climate, socioeconomic implications of global change, physical oceanography, remote sensing.*

John H. Trefry, Ph.D., *trace metal geochemistry and pollution, geochemistry of rivers, global chemical cycles.*

John G. Windsor Jr., Ph.D., *environmental chemistry; pollution; trace organic analysis of air, water, soil, sediment and tissue; gas chromatography; mass spectrometry; environmental education.*

Associate Professors
Ballard M. Barker, Ph.D., *aerial remote sensing applications, climatology.*

Charles R. Bostater Jr., Ph.D., *environmental modeling, remote sensing, estuarine particle dynamics, water quality instrumentation, environmental optics, environmental geophysical fluid dynamics, physical oceanography.*

Howell H. Heck, Ph.D., *fate of chemicals in disposal facilities; volatile chemical emissions from treatment facilities; movement of chemicals across the interface bond of land, air and water.*

Hamid K. Rassoul, Ph.D., *observation and modeling of auroras, photochemistry of the earth's upper-atmosphere, solar wind-magnetosphere interactions.*

Assistant Professors
Elizabeth A. Irlandi, Ph.D., *landscape ecology in aquatic environments, seagrass ecosystems, coastal zone management.*

Kevin B. Johnson, Ph.D., *water column ecology, planktonic grazing and distributions, predator-prey interactions.*

Steven M. Lazarus, Ph.D., *analysis of planetary boundary layer, development and testing of life cycle models, parameterization of thin mid-level stratiform clouds, atmospheric radiation measurement.*

Principal Research Scientist
Chih-shin Shieh, Ph.D., Director, Center for Waste Utilization, *marine pollution processes, waste management, chemistry of solid wastes, trace metal adsorption and leaching.*

Institutional Associate Faculty
Diane D. Barile, M.S., Marine Resources Council, *environmental planning, environmental policy.*

Carol L. Emrich, Ph.D., Florida Solar Energy Center, *satellite meteorology.*

Carlton R. Parks, M.S., ACTA Inc., *synoptic meteorology, weather instrumentation.*

Adjunct Professors
J.A. Angelo, Ph.D.; M.I. Duedall, J.D.; B.E. LaPointe, Ph.D.; F.J. Merceret, Ph.D.; N.P. Smith, Ph.D.; A.C. Steinemann, Ph.D.

The environmental sciences are those areas of applied science concerned with the relationship between human activities and the supporting environment; they provide the scientific framework for rational environmental decisions.

Bachelor of Science Degree Programs

Environmental sciences offerings at Florida Tech include two programs, both solidly based on course work in chemistry, mathematics and physics, combined with specialized environmental science courses and courses in either biology or meteorology, as well as the humanities. Technical electives during the junior and senior years allow flexibility to meet individual interests while building a strong foundation in the environmental sciences. Theoretical concepts are reinforced by laboratory programs and multimedia field studies.

Environmental Science Option

The undergraduate environmental science option is designed to provide graduates with opportunities to pursue careers and advanced academic studies in the use, control and preservation of environmental resources and the enhancement of the quality of life. Graduates have a strong background in biological, chemical and physical sciences, coupled with basic and applied environmental science field, laboratory and course work to help develop solutions to current and future environmental problems. Needs exist throughout the private sector and in local, state and federal agencies for the talents and expertise developed by graduates of this program.

Candidates for a bachelor's degree in environmental science complete a minimum program of 132 semester hours as outlined below. Elective course options from other programs enable the student to either broaden the scope of coverage of the curriculum or to develop a concentration of courses in some specific area of interest. For example, the curriculum can be designed to emphasize biological, chemical or remote sensing studies. The curriculum was developed to give students the solid, well-rounded background necessary to meet the needs of the numerous career opportunities available to graduates.

Freshman Year

FALL	CREDITS
CHM 1101 Chemistry 1	4
COM 1101 Composition and Rhetoric	3
ENS 1001 The Whole Earth Course	3
MTH 1001 Calculus 1	4
	14

SPRING	
CHM 1102 Chemistry 2	4
COM 1102 Writing about Literature	3
MTH 1002 Calculus 2	4
OCN 1010 Oceanography	3
	14

Sophomore Year

FALL	CREDITS
BIO 1010 Biological Discovery 1	4
CHM 2001 Organic Chemistry 1	3
COM 2223 Scientific and Technical Communication	3
PHY 1001 Physics 1	4
PHY 2091 Physics Lab 1	1
	15

SPRING	
BIO 1020 Biological Discovery 2	4
CHM 2002 Organic Chemistry 2	3
CSE 1301 Introduction to Computer Applications	3
or	
CSE 15xx Restricted Elective (Computer Science)	3
OCN 2407 Meteorology	3
PHY 2002 Physics 2	4
PHY 2092 Physics Lab 2	1
	18

Junior Year

FALL	CREDITS
CHM 3301 Analytical Chemistry 1	3
ENS 3101 Atmospheric Environments	3
HUM 2051 Civilization 1	3
OCN 3201 Marine and Environmental Chemistry	3
OCN 3211 Marine and Environmental Chemistry Lab	1
Restricted Elective*	3
	16

SPRING	
ENS 3105 Atmospheric Pollution Lab	1
ENS 3911 Environmental Field Projects Proposal	1
ENS 4010 Geographic Information Systems	3
HUM 2052 Civilization 2	3
Restricted Electives*	10
	18

SUMMER (SENIOR STATUS REQUIRED)	
ENS 4911 Environmental Field Projects	1
ENS 4912 Environmental Field Projects	2
ENS 4913 Environmental Field Projects	3
	6

Senior Year

FALL	CREDITS
ENS 4600 Radiation and Environmental Protection	3
ENS 4800 Limnology 1	3
Social Science Elective	3
Restricted Elective*	3
Free Elective	3
	15

SPRING	
BIO 2010 Microbiology	4
ENS 4701 Environmental Regulation and Impact Assessment	3
OCN 4204 Marine and Environmental Pollution	3
Humanities Elective	3
Technical Elective	3
	16
TOTAL CREDITS REQUIRED	132

**Science (including aviation science), engineering or business courses, subject to the approval of the environmental sciences program chair before registering.*

Meteorology Option

Meteorology is a joint program between the College of Engineering, the College of Science and Liberal Arts and the School of Aeronautics, administered by the environmental sciences program. A related degree program in aviation meteorology is offered by the School of Aeronautics.

Candidates for a bachelor's degree in meteorology complete a minimum of 134 semester hours as outlined below. A student completing at least 24 semester hours including MET 3401, MET 3402, MET 4233, MET 4305, MET 4306, SPS 4030, and six credits from among AVS 3201, ENS 3101, MET 4310 and OCN 3401, is eligible to be certified as a professional meteorologist by the American Meteorological Society and the U.S. Office of Personnel Management, and is thus qualified for entry into positions in NOAA National Weather Service, NASA and the U.S. Armed Forces.

Freshman Year

FALL		CREDITS
CHM 1101	General Chemistry 1	4
COM 1101	Composition and Rhetoric	3
CSE 1301	Introduction to Computer Applications	3
or		
CSE 15xx	Restricted Elective (Computer Science)	3
ENS 1001	The Whole Earth Course	3
MTH 1001	Calculus 1	4
		17

SPRING		
AVS 1201	Aviation Meteorology	3
CHM 1102	General Chemistry 2	4
MTH 1002	Calculus 2	4
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
		16

Sophomore Year

FALL		CREDITS
COM 1102	Writing about Literature	3
MTH 2001	Calculus 3	4
PHY 2002	Physics 2	4
PHY 2092	Physics Lab 2	1
	Social Science Elective	3
		15

SPRING		
COM 2223	Scientific and Technical Communication	3
HUM 2051	Civilization 1	3
MTH 2201	Differential Equations/Linear Algebra	4
OCN 2407	Meteorology	3
PHY 2003	Modern Physics	3
		16

Junior Year

FALL		CREDITS
ENS 3101	Atmospheric Environments	3
MET 3401	Synoptic Meteorology 1	3
MTH 2401	Probability and Statistics	3
OCN 3430	Fundamentals of Geophysical Fluids	3
OCN 3433	Geophysical Fluids Lab	1
PHY 3060	Thermodynamics, Kinetic Theory and Statistical Mechanics	4
		17

SPRING		
ENS 3105	Atmospheric Pollution Lab	1
ENS 3911	Environmental Field Projects Proposal	1
HUM 2052	Civilization 2	3
MET 3402	Synoptic Meteorology 2	3
MTH 3201	Boundary Value Problems	3
SPS 4030	Physics of the Atmosphere	3
	Technical Elective	3
		17

SUMMER		
ENS 4912	Environmental Field Projects 2	2
ENS 4913	Environmental Field Projects 3	3
		5

Senior Year

FALL		CREDITS
ENS 4700	Environmental Hydrology	3
MET 4233	Remote Sensing for Meteorology	3
MET 4305	Atmospheric Dynamics 1	3
OCN 3401	Physical Oceanography	3
OCN 3411	Physical Oceanography Lab	1
	Humanities Elective	3
		16

SPRING		
AVS 3201	Aviation Meteorology 2	3
MET 4306	Atmospheric Dynamics 2	3
MET 4310	Climatology	3
	Technical Elective	3
	Free Elective	3
	TOTAL CREDITS REQUIRED	134

Master of Science Degree Programs

Environmental Science

Today's increasingly complex technological society has placed new demands on our understanding of human interaction with the environment. In fact, the need has never been greater for highly skilled scientists capable of developing basic data from which far-reaching decisions can be made regarding the intelligent use and protection of our natural environment. Recognizing these needs, the environmental science master's program provides a thorough background in the biological and chemical fundamentals of natural environmental systems with specific areas of emphasis related to water and air resources, water and wastewater treatment, hazardous and toxic materials including nuclear wastes and basic processes governing the interaction of humans and the natural environment.

Admission Requirements

Students applying for admission to the environmental science program should have undergraduate majors in the physical or life sciences with strong backgrounds in chemistry and biology. Students with bachelor's degrees in other scientific or engineering fields may need to complete certain preparatory course work prior to starting the master of science program, and completion of such courses may require additional time. Any such requirements will be determined by the program chair and graduate faculty prior to admission. The prospective student will be advised of these requirements prior to acceptance. Applicants must submit GRE General Test scores for evaluation, a statement of interests, a résumé and three letters of recommendation.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

A Master of Science in Environmental Science requires the satisfactory completion of 30 semester hours of required and elective credits based on an approved program plan developed in conjunction with the faculty adviser. Included in the total are 15 hours of core environmental courses as listed below and six credits of thesis research under the supervision of a member of the graduate faculty. Students

are required to attend the graduate seminar. A student registers for graduate seminar each semester and makes an oral presentation of research results after completing thesis research. A nonthesis option is also available. In lieu of the thesis, the student completes an additional nine credits of course work and must pass a written master's comprehensive examination.

Core Environmental Courses

ENS 5000 Environmental Science Seminar 0
ENS 5010 Environmental Optics and Remote Sensing 3
ENS 5101 Introduction to Air Pollution 3
ENS 5700 Introduction to Water Resources 3
ENS 5800 Limnology 3
OCN 5210 Marine and Environmental Chemistry 3

The remaining course work in the master's candidate program is normally developed around one of four areas of specialization. These areas currently include the following:

Environmental Biology—Selected graduate course offerings are available in environmental science, chemical engineering, biology, chemistry, meteorology and oceanography dealing with the environmental monitoring necessary to determine the significance and impact of various types of environmental pollution and perturbations on the integrity and stability of biological systems.

Environmental Chemistry—Selected graduate course offerings are available in environmental chemistry, analytical chemistry, environmental biology, meteorology, chemical oceanography, toxicology, hazardous waste and risk assessment that pertain to the origin, fate, transformation, impact, monitoring and treatment of natural and synthetic chemicals in the environment.

Environmental Optics and Remote Sensing—Selected undergraduate and graduate courses are available in environmental science, oceanography, physics, electrical engineering, computer science and space sciences dealing with remote sensing of the environment (water and land features) and radiative transfer modeling and algorithms. This specialty area pertains to the utilization of remote-sensing data from ground, ship, aircraft and satellite platforms for environmental applications, change detection and natural resources assessments.

Environmental Systems—Advanced graduate course offerings have been specifically selected to address multimedia environmental impact issues and their interactions. Included are air and water (including wetlands) interactions with such multifaceted threats as solid waste, agricultural chemicals and hazardous wastes from municipal, commercial or industrial sources.

Environmental Resource Management

Environmental resource management has become an area of national and international significance. Resource managers, typically in the public and private developmental sectors, face increasingly complex technical problems that cut across several of the more traditional educational disciplines. In addition to the fundamentals of biological and chemical environmental processes, managers must be knowledgeable in local and global cause and effect relationships of human activities in the development and utilization of environmental resources. Resource managers must also understand the legal and regulatory aspects of resources management. Recognizing these multidisciplinary needs, the master's degree program in environmental resource management is closely associated with the environmental science program at Florida Tech and includes both university course work and an internship with a regulatory agency, NGO or private company that manages environmental resources. Graduates are well prepared to effectively interact with engineers, scientists, managers and politicians.

Admission Requirements

Students applying for admission to the environmental resources management program should have undergraduate majors in science or engineering, or sufficient course work in the physical and life sciences and engineering to readily understand the fundamental biological, chemical and physical relationships important in environmental resource management. In some instances, additional preparatory work in some areas may be required at the beginning of the program. The prospective student is advised of such requirements prior to final acceptance. Each applicant is strongly encouraged to arrange for a conference regarding program content and qualifications with faculty and the program chair or other faculty member prior to arriving on campus to begin an academic program.

General admission requirements and application procedures are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The degree requires satisfactory completion of 30 semester hours of required and elective courses. Included in the total are 24 credits of required courses and internship, and six credits of selected elective topics as specified in a master's program plan developed in conjunction with the student's adviser. An internship document is required by the academic unit, and the student makes an oral presentation of the internship assignment to the graduate seminar or a professional society meeting and to the student's internship advisory committee.

Required Courses

BIO 5030 Conservation Biology 3
ENS 5000 Environmental Science Seminar (each semester) 0
ENS 5001 Global Environmental Problems and Solutions 3
ENS 5004 Aquatic Environmental Toxicology 3
ENS 5009 Internship 6
ENS 5700 Introduction to Water Resources 3
ENS 5701 Environmental Regulation and Impact Assessment 3
OCN 5210 Marine and Environmental Chemistry 3

Elective Courses

Acceptable electives for both M.S. programs include:
BUS 4425 Environmental and Urban Planning 3
CVE 4000 Engineering Economy and Planning 3
EDS 5430 Issue Investigation and Evaluation 3
ENS 4001 The Earth System 3
ENS 4010 Geographic Information Systems 3
ENS 5004 Aquatic Environmental Toxicology 3
ENS 5010 Environmental Optics and Remote Sensing 3
ENS 5101 Introduction to Air Pollution 3
ENS 5600 Radiation and Environmental Protection 3
OCN 5801 Coastal Systems Planning 3

Meteorology

Atmospheric science is focused on understanding Earth's gaseous envelope, predicting its evolution and mitigating human impacts. The M.S. program at Florida Tech is uniquely interdisciplinary, drawing on expertise from the College of Engineering, the School of Aeronautics and the College of Science and Liberal Arts. As such, the M.S. in meteorology can have special emphasis in areas such as marine meteorology, water resources, atmospheric chemistry, aviation meteorology or remote sensing. Collaborative research is conducted with specialists from the nearby NASA Kennedy Space Center, the USAF 45th Weather Squadron, the NOAA National Weather Service, the Harbor Branch Oceanographic Institution, WHIRL (Wind and Hurricane Impacts Research Laboratory) and local government agencies or corporations.

Admission Requirements

A student applying for admission to the graduate meteorology program should have an undergraduate major in the physical sciences or engineering. Preparatory course work may need to be completed prior to starting the master of science program, and completion of such courses may require additional time. Any such requirements will be determined by the program chair and graduate faculty prior to admission. The prospective student will be advised of these requirements prior to acceptance. Applicants must submit GRE General Test Scores for evaluation.

Degree Requirements

The M.S. degree requires satisfactory completion of 30 semester hours of required and elective courses including thesis, based on an approved plan developed in conjunction with the faculty adviser. A nonthesis option is also available, where in lieu of a thesis the student completes an additional nine credits of course work (for a total of 33 credits) and must pass a written master's comprehensive examination. Students with bachelor's degrees in meteorology normally take the core courses plus electives emphasizing their areas of special interest. Students with bachelor's degrees in fields other than meteorology are required to complete the core and other graduate courses in addition to appropriate courses necessary for certification as a professional meteorologist by the American Meteorological Society (see undergraduate curriculum). Students are required to attend the graduate seminar. A student registers for graduate seminar each semester and makes an oral presentation of research results after completing thesis research.

Core Courses

ENS 5000 Environmental Sciences Seminar 0
MET 5001 Principles of Atmospheric Science 3
MET 5233 Atmospheric Remote Sensing 3
MET 5305 Dynamic Meteorology 1 3
MET 5306 Dynamic Meteorology 2 3

Elective Courses

Acceptable electives for the meteorology program include
AVS 5201 Aviation Meteorology Theory and Practice 3
AVS 5202 Advanced Aviation Meteorology Lab 1
ENS 4001 The Earth System 3
ENS 4010 Geographic Information Systems 3
ENS 5001 Global Environmental Problems and Solutions 3
ENS 5101 Introduction to Air Pollution 3
ENS 5105 Atmospheric Pollution Lab 1
ENS 5700 Introduction to Water Resources 3
ENS 5800 Limnology 3
MET 4310 Climatology 3
OCE 5570 Marine Hydrodynamics and Wave Theory 3
OCE 5586 Ocean Engineering Data Analysis 3
OCN 5001 Principles of Oceanography 3
OCN 5210 Marine and Environmental Chemistry 3
OCN 5401 Principles of Physical Oceanography 3
OCN 5403 Ocean Wave Theory 3
OCN 5405 Dynamic Oceanography 3
OCN 5407 Marine Meteorology 3
OCN 5409 Geophysical Fluid Dynamics 3
OCN 5704 Oceanic Remote Sensing 3
PHY 5080 Thermodynamics 3
SPS 4030 Physics of the Atmosphere 3
SPS 5031 Planetary Science 2: Atmospheres 3

Doctor of Philosophy Degree Program

Admission Requirements

An applicant for the doctoral program in environmental science must have a bachelor's or master's degree from an accredited institution in environmental science, biology, chemistry or other appropriate science curriculum. In some cases, certain undergraduate courses must be taken to remediate areas of deficiency before a student can start the doctoral program.

For admission, a student should have a superior academic record and at least three letters of recommendation, including one from the master's degree thesis adviser. Preference will be given to students with high scores on the Graduate Record Examination.

Included with the application should be a short but clear statement of the interest and objectives of the applicant. Although not absolutely required, an on-campus interview is highly recommended.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The doctoral degree is primarily a research degree and is conferred in part in recognition of research accomplishments. Each student must complete an approved program of course work; demonstrate proficiency in a foreign language or a computer language, at the discretion of the doctoral committee; pass the comprehensive examinations; write an acceptable research proposal and petition for admission to candidacy; complete a program of significant original research; prepare and defend a dissertation concerning the research; and present a seminar on the research. Each candidate is expected to publish a major portion of the dissertation in refereed national or international journals. A minimum of 24 credit hours of course work and 24 credit hours of dissertation beyond a master's degree are required.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog and on the Florida Tech Graduate Programs Web site.

Curriculum

A program of study must be approved by the student's adviser and the program chair. A wide degree of latitude is allowed in course selection and research interest within the capabilities of the university and the student's academic background.

Prior to admission to doctoral candidacy, the student may be required to demonstrate proficiency in a computer language or a reading proficiency of scientific literature in one foreign language. The chosen language should allow access to important literature in the student's area of research. This requirement is imposed at the discretion of the doctoral committee.

After admission to doctoral candidacy, a yearly seminar demonstrating progress must be presented to the graduate faculty.

Research

Faculty and graduate students are actively engaged in a variety of environmental research projects, including effects of agricultural and urban stormwater runoff on river and estuarine water quality, measurement of quantities and quality of groundwater seepage in Florida lakes, dissolved oxygen budgets in aquatic systems, trace metal contamination of natural waters and sediments, acid deposition, lake trophic state classifications, trace organic contamination in coastal systems, decomposition and sedimentation of aquatic macrophytes and utilization of waste by-products, including ash produced from fossil fuel combustion and municipal incinerators.

Research Facilities

The program offers specialized facilities for instruction and research. The Marine and Environmental Chemistry Laboratory is equipped with standard water and wastewater sampling and analysis equipment. In addition, analytical instruments provided for advanced study include a total organic carbon analyzer, atomic absorption spectrophotometers and scintillation counters. Florida Tech maintains a variety of small and large boats for field work including a 60-foot lagoon- and oceangoing research vessel equipped with laboratory and computer facilities. Analytical capabilities are extended by means of cooperative projects with the departments of biological sciences and chemistry. In addition, an advanced state-of-the-art analytical facility is available to Florida Tech through a cooperative arrangement with the Midwest Research Institute's Palm Bay laboratories. Instrumentation currently available includes GIS, SEM and ICP/MS.

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

Mechanical Engineering

J.J. Engblom, Ph.D., Head

Bachelor of Science *Master of Science* *Doctor of Philosophy*

Areas of Specialization:
Dynamic Systems, Robotics and Controls
Structures, Solid Mechanics and Materials
Thermal-Fluid Sciences

Professors

J. Ronald Bailey, Ph.D., P.E., F.W. Olin Professor, *machine design, vibrations, dynamics of machinery, acoustics, noise control, statistical process control, computer-aided manufacturing.*

Thomas E. Bowman, Ph.D., *fluid mechanics and thermal sciences, energy conversion, solar energy, appropriate solar technologies, microgravity fluid mechanics.*

John J. Engblom, Ph.D., P.E., *computational and experimental mechanics, finite element and boundary element methods, development/modeling, mechanics of composites, computer-aided design, structural dynamics and stability.*

Associate Professors

Pei-feng Hsu, Ph.D., *radiative and multimode heat transfer, premixed combustion in porous ceramics, numerical methods in heat transfer, pulsed laser applications in medical imaging and material property diagnostics, thermal conductivity measurements, heat exchanger design, HVAC systems design.*

Pierre M. Larochelle, Ph.D., P.E., *synthesis and analysis of mechanisms and machines, design and control of robotic manipulators, theoretical kinematics, design of spherical and spatial mechanisms, computer-aided design.*

Kunal Mitra, Ph.D., *thermal fluid sciences with emphasis on laser applications, thermal radiation, microscale heat transfer, material processing, bio heat transfer modeling.*

Yahya I. Sharaf-Eldeen, Ph.D., P.E., *modeling, simulation and design of dynamic systems; advanced dynamics, vibration and design of machinery; thermal-fluid sciences; energy/power systems.*

Assistant Professors

Hector Gutierrez, Ph.D., P.E., *mechatronics, nonlinear control, microprocessor control of electromechanical systems, magnetic suspension systems, intelligent control, automation, computer-based instrumentation, computer-aided engineering of control systems.*

Palmer C. Stiles, M.S., P.E., *machine design, computer-aided manufacturing, robotics, all-terrain and human-powered vehicles, water conservation devices, small-aircraft design, earth-to-orbit vehicles.*

Mechanical engineers are deeply involved in activities that are essential to our modern civilization. These activities include the research, development, design and testing of materials, structures and machines for the generation of power, for transportation and for the production of electricity by the conversion of energy from various sources including chemical, nuclear, solar and geothermal; conception and design of all types of machines that serve humans and their many needs; construction and operation of production machinery for the manufacture of materials and consumer products; and instrumentation, control and regulation of these and other types of manual and automatic mechanical systems.

Bachelor of Science Degree Program

The mechanical engineering undergraduate curriculum at Florida Tech presents the fundamentals underlying modern mechanical engineering and prepares the student for a lifetime of continued learning. During the freshman and sophomore years, the emphasis is placed on mathematics and physics. An introduction to engineering in the freshman year previews the field and gives the students their first experience in engineering design. The sophomore and junior years direct the student toward the engineering sciences, including mechanics of solids, thermodynamics and fluid mechanics. During the junior and senior years, the study becomes progressively centered about the specific issues facing practicing mechanical engineers. The student uses the basic tools imparted during the first two years and applies them in studies of machine systems, instrumentation, automatic controls, thermal systems and design projects. Other courses taken

during the last two years expand the student's knowledge in the fields of heat transfer, electronics, vibrations and mathematics. Technical electives taken during the senior year allow the student to direct the program toward specific areas of personal interest.

Laboratory experiences are essential to the education of engineers, and these are provided in chemistry, physics, computer-aided design, materials, fluids and heat transfer. The capstone of the educational process is the senior mechanical engineering design project, which synthesizes and focuses elements from the various disciplines into a design activity of current mechanical engineering interest. The faculty serve jointly in the supervision and consultation for these projects.

After graduation, the mechanical engineering student is prepared to pursue a career either in industry or government as a practicing engineer, or to enter graduate work in engineering, applied mechanics or mathematics. In some cases, mechanical engineering graduates also enter professional schools of medicine, law or business.

Students are encouraged to define career objectives early in the program (preferably during the sophomore year) so that in consultation with faculty advisers, electives can be selected that are best suited to the achievement of specific goals.

The mission of the mechanical and aerospace engineering department is to graduate students who are well grounded in the engineering sciences, can design and conduct experiments, have the ability to design complex components and systems, and understand manufacturing processes. Our objectives include instilling in our graduates an ability to function on multidisciplinary design teams; to identify, formulate and solve engineering problems; to understand the impact of their solutions in a global/societal context; to understand their professional and ethical responsibilities; to communicate effectively; and to recognize the importance of lifelong learning opportunities and of a knowledge of contemporary issues relevant to their profession.

Degree Requirements

Candidates for a Bachelor of Science in Mechanical Engineering must complete the minimum course requirements as outlined in the following curriculum.

For definitions of electives for engineering programs, see the *Undergraduate Information and Regulations* section of this catalog.

Freshman Year

FALL	CREDITS
CHM 1101 General Chemistry 1	4
COM 1101 Composition and Rhetoric	3
MAE 1022 Introduction to Mechanical Engineering 1	2
MTH 1001 Calculus 1	4
Social Science Elective	3
	16
SPRING	
COM 1102 Writing about Literature	3
CSE 150x Introduction to Software Development	3
MAE 1023 Introduction to Mechanical Engineering 2	1
MTH 1002 Calculus 2	4
PHY 1001 Physics 1	4
PHY 2091 Physics Lab 1	1
	16

Sophomore Year

FALL	CREDITS
CHE 3260 Materials Science and Engineering	3
CHE 3265 Materials Lab	1
COM 2223 Scientific and Technical Communication	3
MAE 2081 Applied Mechanics: Statics	3
MTH 2001 Calculus 3	4
PHY 2002 Physics 2	4
	18
SPRING	
MAE 2024 Solids Modeling and 3-D Mechanical Design Principles	3
MAE 2082 Applied Mechanics: Dynamics	3
MAE 3083 Mechanics of Materials	3
MAE 3191 Engineering Thermodynamics 1	3
MTH 2201 Differential Equations/Linear Algebra	4
PHY 2092 Physics Lab 2	1
	17

Junior Year

FALL	CREDITS
HUM 2051 Civilization 1	3
MAE 3024 Computer-Aided Engineering	3
MAE 3061 Fluid Mechanics 1	3
MAE 3064 Fluid Mechanics Lab	1
MAE 3192 Engineering Thermodynamics 2	3
MTH 3201 Boundary Value Problems	3
	16
SPRING	
HUM 2052 Civilization 2	3
MAE 3090 Design of Machine Elements	3
MAE 3091 Theory of Machines	3
MAE 4171 Principles of Heat Transfer	3
MAE 4190 Design Methodologies and Practice	1
Restricted Elective (Engineering)	3
	16

Senior Year

FALL	CREDITS
ECE 4991 Electric and Electronic Circuits	3
MAE 4024 Mechanical Vibrations	3
MAE 4071 Thermal Systems Design	3
MAE 4074 Heat Transfer Lab	1
MAE 4193 Mechanical Engineering Design 1	3
Technical Elective	3
	16
SPRING	
MAE 4014 Control Systems	3
MAE 4175 Heating, Ventilation and Air Conditioning	3
MAE 4194 Mechanical Engineering Design 2	4
Humanities Elective	3
Free Elective	3
TOTAL CREDITS REQUIRED	131

Master of Science Degree Program

All master of science options can be earned on either a full-time or a part-time basis. A two-year projection of course offerings is available upon request. Course offerings are arranged to permit the master's program to be completed by full-time students in a maximum of two calendar years.

Admission Requirements

The undergraduate backgrounds of applicants for admission to the master's degree (M.S.M.E.) programs vary considerably. For this reason, a variety of master's degree options are available. The applicant should have a bachelor of science or equivalent degree from a mechanical engineering program accredited by the Accreditation Board for Engineering and Technology (ABET). In evaluating an international application, consideration is given to academic standards of the school attended and the content of the courses leading to the degree obtained. Master's applicants are required to take the Graduate Record Examination (General Test).

Applicants whose bachelor's degrees are in other engineering fields, mathematics, or the physical sciences may be accepted, but will be required to remedy any deficiencies by satisfactorily completing a number of undergraduate courses in preparation for graduate study in mechanical engineering.

Degree Requirements

The Master of Science in Mechanical Engineering is offered with both thesis and nonthesis options. Each option requires a minimum of 30 credit hours of approved graduate study; however, within each option, course choices vary considerably. Prior to the completion of nine credit hours, the student must submit for approval a master's degree program plan to indicate the path chosen and the specific courses to be taken. Up to six credit hours of thesis work may be included in the 30 credit hour requirement. The nonthesis option requires that the candidate satisfactorily complete a minimum of 30 credit hours of course work and the master's final program examination.

Curriculum

Regardless of which degree path the student chooses, the degree candidate must choose one of three specialization fields. Listed below are required and elective courses for the master of science specializations.

Structures, Solid Mechanics and Materials Specialization

Three core courses selected in consultation with the student's adviser from the list below: 9
MAE 5050 Finite Element Fundamentals
MAE 5060 Applications in Finite Element Methods
MAE 5410 Elasticity
MAE 5420 Advanced Mechanical Design
MAE 5460 Fracture Mechanics and Fatigue of Materials
MAE 5470 Principles of Composite Materials
Mathematics 6
Approved electives, which may include 6 credit hours of thesis 15
TOTAL CREDITS REQUIRED 30

Specialization in this area focuses on analytical and computational techniques as they apply in design. Each student plans a program of study in consultation with a member of the faculty whose professional field is related to the student's interests.

Thermal-Fluid Sciences Specialization

Three core courses selected in consultation with the student's adviser from the list below: 9
MAE 5130 Viscous Flows
MAE 5210 Conduction Heat Transfer
MAE 5220 Convection Heat Transfer
MAE 5230 Radiation Heat Transfer
Mathematics 6
Approved electives, which may include 6 credit hours of thesis 15
TOTAL CREDITS REQUIRED 30

Specialization in this area focuses on heat transfer, combustion and energy systems. Analytical, computational and experimental techniques are emphasized.

Dynamic Systems, Robotics and Controls Specialization

Three core courses selected in consultation with the student's adviser from the list below: 9
MAE 5610 Advanced Dynamics
MAE 5630 Modeling and Simulation of Dynamic Systems
MAE 5650 Robotics
MAE 5660 Robot Control
Mathematics 6
Approved electives, which may include 6 credit hours of thesis 15
TOTAL CREDITS REQUIRED 30

The student's program of study in this area will be tailored to provide the background and training to pursue a career in a desired and related area of interest. Examples of related areas include design and control of dynamic systems, robotics, vibration, automotive engineering, biomedical engineering, energy and power systems, etc.

Doctor of Philosophy Degree Program

The doctor of philosophy degree is offered for students who wish to carry out advanced research in any of the three optional areas of specialization listed under the master of science program. Other research areas may or may not correlate well with current faculty interests and laboratory facilities. In such cases, the mechanical engineering department head should be consulted to determine the feasibility of pursuing advanced research topics that are outside of the three optional areas listed.

Admission Requirements

A candidate for the doctoral program will normally have completed a master's degree in mechanical engineering or a related field and have adequate preparation in areas of science and mathematics fundamental to his or her field of study. In addition, a student enrolled in the master's program may apply to work directly toward the doctoral degree after completing at least 18 credits of graduate course work at Florida Tech with a cumulative grade point average of at least 3.5.

Doctoral applicants should have superior academic records, provide letters of recommendation and take the Graduate Record Examination (GRE) General Test.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The degree of doctor of philosophy is conferred primarily in recognition of creative accomplishment and ability to investigate scientific or engineering problems independently, rather than for completion of a definite course of study. The work should consist of advanced studies and research leading to a significant contribution to the knowledge of a particular problem. A student's research may have analytical, computational or experimental components, or some combination. Each student is expected to complete an approved program of study beyond that required for a master's degree, pass the comprehensive written/oral examination, complete a program of significant original research and prepare and defend a dissertation concerning the research work.

The purpose of the comprehensive examination is to cover the student's major field of study and related fields important to the major field. The examination is given when, in the judgment of the student's advisory committee, the student has had sufficient preparation in his/her field of study by completing significant course work in at least three areas of specialization and by initiating doctoral research. The examination must normally be taken before the end of the student's fourth academic semester, as counted from admission into the doctoral program. The written portion of the examination consists of individual examinations given by each member of the advisory committee. These written

examinations are intended to cover each of the student's areas of specialization. The written portion of the comprehensive examination is followed by an oral component administered by the student's advisory committee. The oral examination provides the advisory committee an opportunity to complete the examinations in each of the student's specialty areas. Subsequent to completion of both written and oral components of the examination, a dissertation proposal must be submitted to the student's advisory committee for evaluation. Upon determining that the proposed research is of doctoral quality and that completion is feasible, the student is advanced to candidacy for the doctoral degree.

COURSE WORK AND THESIS SUMMARY	CREDITS
Doctoral course work minimum beyond master's degree	24
Doctoral research and dissertation	24
TOTAL MINIMUM BEYOND THE MASTER'S DEGREE	48

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

The student's master's and doctoral course work combined should include a minimum of 24 credits in mechanical engineering and 12 credits in mathematics. The doctoral program of study must be approved by the student's adviser and the department head. The distribution of these courses should include courses in each of the three optional fields of specialization, and as a minimum should have the credit distribution given below:

Major Field (including master's courses)	18
Minor Fields (including master's courses)	9 (each)
Mathematics (including master's courses)	12

Research Activities and Facilities

Mechanical and aerospace engineering shared facilities include laboratories for energy research, fluid mechanics and aerodynamics, combustion and propulsion, metallurgy and solid mechanics, system dynamics and control, instrumentation and applied laser research, computer-aided design and computational research. Other laboratories around the campus can also be used by mechanical engineering graduate students performing advanced research.

Funded research activities of the mechanical and aerospace engineering faculty have recently included studies of efficient heat transfer/insulation mechanisms in building environments, advanced HVAC and fuel cell systems, integration of renewable energy sources into residential and utility applications, computation of radiative transport, computational mechanics with emphasis on damage mechanisms in laminated composite structures, development of experimental techniques for mechanical behavior of advanced materials systems, thermomechanical behavior of microelectronics packages/devices, design/manufacture of smart human hip prostheses, turbulent boundary-layer structure, study of leaks in cryogenic seals, condition monitoring and fault diagnosis in rotating machinery and turbulent transport of moisture contained in air streams. Other studies have involved convection and diffusion of radon gas in porous media, design of a PD controller for robot manipulators, response of occupants in automobile collisions, thermal management of electronic equipment, smart composite structures with embedded sensors and optimization of composites. Research projects have been variously supported through grants from NASA, National Science Foundation, Defense Nuclear Agency, Air Force Office of Scientific Research, Edith Bush Charitable Foundation, Florida Solar Energy Center, Florida Space Grant Consortium, Department of Energy and a number of industrial affiliations.

Please refer to the *Research: Institutes, Centers and Major Laboratories* section of this catalog for further information regarding the Dynamic Systems and Controls Laboratory; the Laser, Optics and Instrumentation Laboratory; and the Robotics and Spatial Systems Laboratory.

Ocean Engineering

DEPARTMENT OF MARINE AND ENVIRONMENTAL SYSTEMS
G.A. Maul, Ph.D., Head

Bachelor of Science *Master of Science* *Doctor of Philosophy*

Areas of Specialization:
Coastal Processes and Engineering
Hydrographic Engineering
Materials and Structures
Naval Architecture and Ocean Systems

Program Chair
Andrew Zborowski, Ph.D.

Professors
Geoffrey W.J. Swain, Ph.D., *materials, corrosion, biofouling, offshore technology, ship operations.*

Andrew Zborowski, Ph.D., *naval architecture, marine hydrodynamics, ship model tank studies, dynamics of marine vehicles, design of high-speed small craft.*

Associate Professor
Lee E. Harris, Ph.D., P.E., *coastal engineering, coastal structures, beach erosion and control, physical oceanography.*

Visiting Associate Professor
Stefan Grochowalski, Ph.D., *ship dynamics in waves, ship stability, ship maneuverability, mathematical modeling and model experiments, stability safety criteria and standards.*

Assistant Professors
Eric D. Thosteson, Ph.D., P.E., *coastal and nearshore engineering, coastal processes, wave mechanics, sediment transport.*

Stephen L. Wood. Ph.D., *underwater robotics, underwater vehicles, advanced navigation and control systems.*

Professor Emeritus
J.C. Sainsbury, Ph.D.

Adjunct Professors
S. Bradfield, Ph.D.; A.M. Clark, Ph.D.; W.R. Dally, Ph.D., P.E.; R.P. Reichard, Ph.D.

Lecturer
W.A. Cleary, M.S., P.E.

The Department of Marine and Environmental Systems combines the expertise of both scientists and engineers. The ocean engineering faculty includes highly qualified researchers engaged in the study of port and harbor facilities, the modeling of estuarine environments, the design and construction of marine vehicles, the impact of waste disposal in the sea, the effects and prevention of coastal erosion and sediment transport, offshore engineering, hydrographic surveying and corrosion in the marine environment. In addition to these studies, various scientific investigations in the bioenvironmental, chemical, physical and geological oceanographic fields incorporate ocean engineering expertise.

Bachelor of Science Degree Program

The ocean engineering program offers education that is unique among engineering disciplines in providing an intimate and practical knowledge of the environment in which the graduate will operate. The result is a diverse curriculum with a strong foundation in all the engineering fields as well as in oceanography. The educational objectives of the program are:

1. To provide multidisciplinary hands-on education, oriented toward industry needs, with emphasis on basic engineering sciences, design experience and modern engineering tools and methods.
2. To offer a curriculum that incorporates important components of modern ocean engineering fields, and is broad enough to prepare students to enter graduate school in engineering and related fields.
3. To graduate engineers who are aware of society's needs and are able to effectively communicate the effects of technology on social development, and the impact of technology on the environment.

The first two years of study are devoted to developing a scientific foundation in mathematics, physics, chemistry, mechanics, computer programming and humanities. During the junior year, the student acquires knowledge of ocean science and the basics of engineering analysis. The fourth year is oriented toward the application of these basic techniques to ocean engineering problems. All students are required to obtain firsthand field and sea experience during the marine field projects held during the summer between the junior and senior years. These projects encourage the student to learn to analyze, design, construct, install and operate equipment in the marine environment for a particular designated task. The College of Engineering operates several small boats and a well-equipped 60-foot research vessel, the *R/V Delphinus*, for offshore, estuarine and river work.

Degree Requirements

Candidates for a Bachelor of Science in Ocean Engineering must complete the minimum course requirements outlined in the following curriculum.

For definitions of electives for engineering programs, see the *Undergraduate Information and Regulations* section of this catalog.

Freshman Year

FALL		CREDITS
BUS 1301	Basic Economics*	3
CHM 1101	General Chemistry 1	4
COM 1101	Composition and Rhetoric	3
MTH 1001	Calculus 1	4
OCN 1010	Oceanography	3
		17

SPRING		
COM 1102	Writing about Literature	3
MTH 1002	Calculus 2	4
OCE 1001	Introduction to Ocean Engineering	3
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
	Restricted Elective (Computer Science)	3
		18

**Or Social Science Elective*

Sophomore Year

FALL		CREDITS
MAE 2081	Applied Mechanics: Statics	3
MTH 2001	Calculus 3	4
PHY 2002	Physics 2	4
PHY 2092	Physics Lab 2	1
OCE 3011	Engineering Materials	3
OCE 3012	Engineering Materials Lab	1
		16

SPRING		
HUM 2051	Civilization 1	3
MAE 2082	Applied Mechanics: Dynamics	3
MAE 3083	Mechanics of Materials	3
MTH 2201	Differential Equations/Linear Algebra	4
OCN xxxx	Restricted Elective (Oceanography)	3
		16

Junior Year

FALL		CREDITS
COM 2223	Scientific and Technical Communication	3
HUM 2052	Civilization 2	3
OCE 3030	Fluid Mechanics	3
OCE 3033	Fluid Mechanics Lab	1
OCN 3401	Physical Oceanography	3
	Free Elective	3
		16

SPRING		
ECE 4991	Electric and Electronic Circuits	3
MAE 3191	Engineering Thermodynamics 1	3
OCE 3521	Hydromechanics and Wave Theory	3
OCE 3522	Water Wave Lab	1
OCE 4541	Ocean Engineering Design	3
OCE 4571	Fundamentals of Naval Architecture 1	3
		16

SUMMER		
OCE 4911	Marine Field Project 1	1
OCE 4912	Marine Field Project 2	2
OCE 4913	Marine Field Project 3	3
		6

Senior Year

FALL		CREDITS
CVE 3015	Structural Analysis and Design	3
OCE 4525	Coastal Engineering: Structures	3
OCE 4545	Hydroacoustics	3
OCE xxxx	Restricted Elective (Ocean Engineering)	3
	Humanities Elective	3
		15

SPRING		
CVE 4000	Engineering Economy and Planning	3
OCE 4518	Protection of Marine Materials	3
OCE 4561	Fundamentals of Offshore Engineering	3
	Humanities or Social Science Elective	3
	Technical Elective	3
		15

TOTAL CREDITS REQUIRED 135

Lists of recommended elective courses are available from the department office.

Master of Science Degree Program

The curriculum is designed to allow the ocean engineer to broaden professional expertise in preparation for a challenging career in industry or for further graduate study. Although emphasis is placed on a core of required courses, the student is encouraged to concentrate efforts in one of several areas of interest through a choice of elective courses. Both thesis and nonthesis tracks are available. Although not required for admission, an on-campus interview is highly recommended.

The Master of Science in Ocean Engineering can be earned on either a full-time or part-time basis. Although a full-time student may complete course work within two or three semesters, thesis activities normally involve a further one or two semesters of study. Graduate student assistants normally require additional time. A student can start graduate studies in either the fall or spring semester, but fall semester is recommended.

Admission Requirements

An applicant should normally have an undergraduate degree in some field of engineering or in one of the physical sciences. Every applicant should have a mathematics background through differential equations along with introductory courses in physics, chemistry and computer programming. A student who has graduated from a non-engineering program will be required to complete additional course work as part of the master's degree program. Although not required for admission, an on-campus interview is highly recommended.

Applications from international students are invited and will be evaluated with consideration given to academic standards in the country where baccalaureate studies were taken.

General admission requirements and application procedures are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The degree of Master of Science in Ocean Engineering is conferred on students who have successfully completed a minimum of 30 credit hours (including thesis) of required and elective course work. Thesis work may be primarily analytical or experimental in nature, or a comprehensive design study, or a computational investigation involving state-of-the-art computer modeling techniques. The thesis may be replaced by three courses (9 credits) following approval of a written petition to the program chair. The nonthesis track requires a minimum of 33 credit hours, an oral comprehensive examination and a technical paper. A thesis is usually required for any student receiving financial support through the Department of Marine and Environmental Systems.

Curriculum

MTH xxxx Mathematics 3
OCE 5515 Materials for Marine Applications 3
OCE 5570 Marine Hydrodynamics and Wave Theory 3
OCE 5990 Ocean Engineering Seminar 0
OCE 5999 Thesis Research* 6
OCN 5401 Principles of Physical Oceanography 3
Subject Area Courses 9
Elective 3
TOTAL CREDITS REQUIRED 30

**May be replaced by nine credits of course work and a major paper.*

Areas of Specialization

The subject area requirement is met by taking at least three courses from one of the following groups:

Coastal Processes and Engineering
OCE 5525 Coastal Processes and Engineering
OCE 5526 Advanced Coastal Engineering Structures
OCE 5563 Port and Harbor Engineering
OCE 5586 Ocean Engineering Data Analysis

Hydrographic Engineering
ENS 4010 Geographic Information Systems
OCE 4545 Hydroacoustics
OCE 5550 Bathymetry
OCE 5571 Naval Architecture
OCE 5586 Ocean Engineering Data Analysis
OCN 5704 Oceanic Remote Sensing

Materials and Structures
MAE 5050 Finite Element Fundamentals
OCE 4574 Structural Mechanics of Marine Vehicles
OCE 5519 Corrosion Engineering
OCE 5526 Advanced Coastal Engineering Structures

Naval Architecture and Ocean Systems
OCE 4573 Ship Design
OCE 5542 Ocean Engineering Systems
OCE 5571 Naval Architecture
OCE 5573 Dynamics of Marine Vehicles
OCE 5575 Applied Marine Hydrodynamics

Recommended Electives

An additional course to meet the minimum total requirements for the degree can be selected from the following list of recommended electives. Other courses can also be elected with approval of the student advisory committee.
CVE 5025 Foundation Design
ENS 5701 Environmental Regulation and Impact Assessment
MAE 5610 Advanced Dynamics
OCE 4575 Design of High-Speed Small Craft
OCN 5204 Marine Pollution
OCN 5210 Marine and Environmental Chemistry
OCN 5405 Dynamic Oceanography
OCN 5409 Geophysical Fluid Dynamics
ORP 5041 Reliability Analysis
ORP 5042 Reliability, Availability and Maintainability

Doctor of Philosophy Degree Program

Admission Requirements

Admission to doctoral study is granted to a limited number of applicants, and normally requires a master's degree, with a GPA of at least 3.3 out of 4.0, in a program that provides suitable preparation for doctoral-level studies in ocean engineering.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The doctor of philosophy degree is awarded in recognition of scientific accomplishment and the ability to investigate scientific problems independently. The program consists of advanced studies to prepare the student for engineering research, and completion of a research project that leads to a significant contribution to the knowledge of a particular

problem. Each student must pass the preliminary written examination, complete an approved program of study, pass the comprehensive written and oral examinations, complete a program of significant research, publish the results of the research and prepare and defend a dissertation concerning the research.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

Doctoral course work minimum credits beyond the master's degree 24
Doctoral thesis minimum credits 24
MINIMUM CREDITS BEYOND MASTER'S DEGREE 48

Courses must be taken in several areas to assure that all graduates of the doctoral program possess the breadth of knowledge necessary to work in the field of ocean engineering. A minimum of nine credits of course work must be taken in mathematics and computer science, and 21 credits must be taken in engineering, as part of the student's graduate course work (including master's courses). A minimum of 15 credits of course work must be directly related to the dissertation research.

The dissertation research is normally conducted on a topic related to current faculty research. The ocean engineering program faculty currently have research interests in coastal engineering, corrosion and naval architecture.

After admission to doctoral candidacy, a yearly seminar demonstrating progress must be presented to the graduate faculty.

Research Activities and Facilities

The department of marine and environmental systems occupies the first and second floors of the Link Building with laboratory, lecture, computer facilities and office space. A general description of these facilities is included in the "Oceanography" section of this catalog.

The ocean engineering program includes facilities for traditional design activities, several stations for computer-aided design techniques and a reference data collection. Ocean engineering provides facilities for structural testing and pressure testing and a Surf Mechanics Laboratory. The materials and corrosion lab specializes in design and testing of materials (concrete, composites and plastics) for marine applications. A towing tank is available at the nearby Harbor Branch Oceanographic Institution in Fort Pierce.

Research interests of the faculty center around coastal engineering, corrosion and materials, ocean mineral exploitation, waste disposal, naval architecture and shipbuilding (including small craft), fluid dynamics, instrumentation and commercial fisheries engineering and development, and marine positioning.

A close relationship is maintained with the Engineering Division of Harbor Branch Oceanographic Institution. Graduate students, especially those having interests in submersibles, exploratory equipment and instrumentation, may have the opportunity to conduct thesis research in conjunction with the Harbor Branch staff and use facilities at the institution.

Ship and marine facilities provide an excellent base for research activities involving all aspects of offshore and coastal ship operations, structures, erosion, and environmental control applications. The sheltered waters and geography of the Indian River Lagoon allow excellent conditions for undertaking control and propulsion research using large models or full-scale craft.

DEPARTMENT OF MARINE AND ENVIRONMENTAL SYSTEMS
G.A. Maul, Ph.D., Head

Oceanography

Bachelor of Science	*Master of Science*	*Doctor of Philosophy*
Areas of Concentration:	*Options in:*	
Biological Oceanography	*Biological Oceanography*	*(For related degree programs see Biological Sciences, Environmental Sciences and Ocean Engineering)*
Chemical Oceanography	*Chemical Oceanography*	
Coastal Zone Management	*Coastal Zone Management*	
Marine Environmental Science	*Geological Oceanography*	
Physical Oceanography	*Physical Oceanography*	

Program Chair
John G. Windsor Jr., Ph.D.

Professors

Iver W. Duedall, Ph.D., *chemical oceanography, physical chemistry of seawater, geochemistry, marine pollution, waste management and the ocean.*

George A. Maul, Ph.D., *ocean circulation, geophysical and socio-economic aspects of climate and sea-level change, marine geodesy, earth system science, satellite oceanography, hydrography.*

Geoffrey W.J. Swain, Ph.D., *marine corrosion and fouling, hydrographic and benthic surveys.*

John H. Trefry, Ph.D., *marine trace metal geochemistry, interstitial water chemistry, heavy metal pollution, hydrothermal systems.*

John G. Windsor, Ph.D., *pollution trace organic analysis, organic chemistry, sediment-sea interaction, mass spectrometry, hazardous/toxic substances research, environmental education.*

Gary A. Zarillo, Ph.D., *sediment transport technology, coastal and estuarine sedimentation, barrier island and tidal inlet processes.*

Associate Professors

Charles R. Bostater Jr., Ph.D., *environmental modeling, remote sensing, estuarine particle dynamics, water quality instrumentation, environmental planning, environmental geophysical fluid dynamics.*

Lee E. Harris, Ph.D., P.E., *ocean engineering, coastal structures, beach erosion and control, physical oceanography.*

Assistant Professors

Elizabeth A. Irlandi, Ph.D., *landscape ecology in aquatic environments, seagrass ecosystems, coastal zone management.*

Kevin B. Johnson, Ph.D., *water column ecology, planktonic grazing and distributions, intraplanktonic predator-prey interactions.*

Eric D. Thosteson, Ph.D., *coastal and near-shore engineering, coastal processes, wave mechanics, sediment transport.*

Professors Emeriti
Dean R. Norris, Ph.D.; John C. Sainsbury, Ph.D.

Adjunct Professors
B.E. LaPointe, Ph.D.; F. Merceret, Ph.D.; D.T. Resio, Ph.D.; R.W. Virnstein, Ph.D.

Institutional Associate Faculty
Diane D. Barile, M.S., Past Executive Director, Marine Resources Council, *environmental planning, environmental policy.*

R. Grant Gilmore Jr., Ph.D., Dynamac Corp., *biological oceanography.*

M. Dennis Hanisak, Ph.D., Harbor Branch Oceanographic Institution, *biological oceanography.*

Craig M. Young, Ph.D., Harbor Branch Oceanographic Institution, *biological oceanography.*

The Department of Marine and Environmental Systems integrates the expertise and skills of ocean scientists, engineers and managers. The oceanography faculty includes highly qualified individuals devoted to research involving the study of ocean currents and waves, coastal processes, planktonic and benthonic organisms, marine meteorology, hydroacoustic applications, trace-metal and pollution identification and distribution. How these research efforts impact the deep-sea, coastal and estuarine environment is the subject of numerous publications and technical reports, which have been prepared by both faculty and students.

Much of the instructional work on estuarine and coastal waters is conducted as part of applied research contracts that utilize the program's small motor-powered skiffs and the *R/V Delphinus*, a 60-foot, twin-diesel-powered vessel for estuarine and offshore work. Access to the ocean is through Port Canaveral; the Gulf Stream can be reached in about three hours. This route to the sea also provides convenient access to the Bahamas and the Florida Keys.

Bachelor of Science Degree Program

The program leading to the Bachelor of Science in Oceanography combines classroom and laboratory work at the main campus in Melbourne with the analysis of oceanographic data collected by students using program research vessels and boats.

During the first two years, the student concentrates on building a strong foundation in biology, chemistry, mathematics, physics and the humanities. The student can then choose one of five concentrations: biological, chemical or physical oceanography, coastal zone management, or marine environmental science. Transferring from one concentration to another during the first two years will incur little or no loss of academic credits. In all concentrations, emphasis is placed on a strong scientific background for the student so that he or she is prepared for more advanced studies in graduate school or employment by industry or government. The program promotes the concept of applied research through a summer Marine Field Project. Both programs are conducted under the direction of faculty members and are designed to help the student use previous academic course work in a relevant manner. The marine studies/oceanography undergraduate curricula are designed to prepare the graduate for a professional scientific career and graduate studies, exploring the scientific implications of human activities in and near the oceans.

Oceanography offers five program concentrations:

Biological Oceanography—Biological oceanography provides training in all areas of oceanography with emphasis on biological aspects. Advanced courses in biology supplement those in oceanography.

Chemical Oceanography—This concentration includes practical training in marine and environmental chemistry. Advanced courses in chemistry supplement those in oceanography.

Coastal Zone Management—Commonly called CZM, this concentration provides training in all areas of oceanography, while providing knowledge of decision-making and management concepts.

Marine Environmental Science—This concentration offers a flexible curriculum that can be tailored to meet specific educational/professional goals within the broad field of marine science.

Physical Oceanography—Physical oceanography is the most quantitative concentration, including advanced courses in mathematics and engineering as well as oceanography.

Students interested in environmental sciences should also see the "Environmental Sciences" section of this catalog.

Degree Requirements

All Concentrations

Freshman Year

FALL		CREDITS
BUS 1301	Basic Economics*	3
CHM 1101	Chemistry 1	4
COM 1101	Composition and Rhetoric	3
ENS 1001	The Whole Earth Course	3
MTH 1001	Calculus 1	4
		17

SPRING		
CHM 1102	Chemistry 2	4
COM 1102	Writing about Literature	3
CSE 1301	Introduction to Computer Applications	3
or		
CSE 15xx	Restricted Elective (Computer Science)	3
MTH 1002	Calculus 2	4
OCN 1010	Oceanography	3
		17

Sophomore Year

FALL		CREDITS
HUM 2051	Civilization 1	3
OCN 2602	Environmental Geology	3
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
	Concentration Courses	3–6
		14–17

SPRING		
BIO 1020	Biological Discovery 2	4
MTH 2401	Probability and Statistics	3
OCN 2407	Meteorology	3
PHY 2002	Physics 2	4
PHY 2092	Physics Lab 2	1
	Concentration Courses	0–1
		15–16

Junior Year

FALL	CREDITS
COM 2223 Scientific and Technical Communication	3
OCN 3201 Marine and Environmental Chemistry	3
OCN 3211 Marine and Environmental Chemistry Lab	1
OCN 3401 Physical Oceanography	3
OCN 3411 Physical Oceanography Lab	1
Concentration Courses	4–7
	15–18

SPRING	
OCN 3101 Biological Oceanography	3
OCN 3111 Biological Oceanography Lab	1
OCN 3301 Geological Oceanography	3
OCN 3311 Geological Oceanography Lab	1
OCN 3911 Marine Field Projects: Proposal	1
Concentration Courses	6–8
	15–17

SUMMER	
OCN 4911 Marine Field Projects 1**	1
OCN 4912 Marine Field Projects 2	2
OCN 4913 Marine Field Projects 3***	3
	6

Senior Year

FALL	CREDITS
HUM 2052 Civilization 2	3
OCN 4704 Remote Sensing for Oceanography	3
Restricted Electives (OCN or ENS)	3
Concentration Courses	6–7
	15–16

SPRING	
OCN 4204 Marine and Environmental Pollution	3
Humanities Elective	3
Free Elective	3
Concentration Courses	3–7
	12–16
TOTAL CREDITS REQUIRED	133

** Or Social Science Elective*

***CZM students may take a free elective*

****CZM students may take OCN 4996 (Internship) or a Technical Elective*

Concentration Courses (29 credits)

Biological Oceanography

BIO 1010 Biological Discovery 1	4
BIO 3510 Invertebrate Zoology	4
BIO 4710 Marine Biology	4
CHM 2001 Organic Chemistry 1	3
CHM 2002 Organic Chemistry 2	3
OCN 4106 Mitigation and Restoration of Coastal Systems	3
Technical Electives	8

Chemical Oceanography

CHM 2001 Organic Chemistry 1	3
CHM 2011 Organic Chemistry 1 Lab	2
CHM 2002 Organic Chemistry 2	3
CHM 2011 Organic Chemistry 2 Lab	2
CHM 3301 Analytical Chemistry 1	3
CHM 3311 Analytical Chemistry 1 Lab	2
OCE 4518 Protection of Marine Materials	3
Technical Electives	11

Coastal Zone Management

BIO 1501 Introduction to Aquaculture	1
BIO 3550 Applications of Aquaculture Technology	3
BUS 2201 Accounting Principles 1	3
BUS 3501 Management Principles	3
ENS 4010 Geographical Information Systems	3
ENS 4701 Environmental Regulations/Impact Assessment	3
OCN 4106 Mitigation and Restoration of Coastal Systems	3
OCN 4996 Internship (or Technical Elective)	3
Free Elective	1
Restricted Electives (Science, Engineering, Business)	6

Marine Environmental Science

BIO 1010 Biological Discovery 1	4
ENS 4600 Radiation and Environmental Protection	3
ENS 4701 Environmental Regulations/Impact Assessment	3
OCN 4106 Mitigation and Restoration of Coastal Systems	3
Restricted Elective (OCN or ENS)	3
Technical Electives	13

Physical Oceanography

MTH 2001 Calculus 3	4
MTH 2201 Differential Equations/Linear Algebra	4
MTH 3201 Boundary Value Problems	3
OCE 3521 Hydromechanics and Wave Theory	3
OCE 3522 Water Wave Lab	1
OCN 3430 Fundamentals of Geophysical Fluids	3
OCN 3433 Geophysical Fluids Lab	1
OCN 4405 Dynamic Oceanography	3
Technical Electives.	7

Master of Science Degree Program

The master of science degree can be earned in one of five options: biological, chemical, geological or physical oceanography, or coastal zone management. The successful student is well prepared for a challenging professional career or for continuing with graduate studies.

Admission Requirements

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Students may be admitted during any semester, but for optimal scheduling the fall term is recommended. Students with deficiencies in their undergraduate preparation (up to 12 credits) may take deficiencies and courses for graduate credit concurrently. Graduate Record Examination General Test scores and a statement of objectives (see page 30) are required and should be sent to the Office of Graduate Admissions. Although nor required for admission, an on-campus interview is highly recommended.

Biological—The applicant should have an undergraduate major in one of the physical or life sciences with a background that includes computer science, mathematics through calculus and at least one year each of college biology, chemistry and physics. The biological background should include invertebrate zoology.

Chemical—The applicant's undergraduate major should be in chemistry, mathematics, physical science or engineering. The academic background should include computer science, mathematics through calculus, and organic, physical and analytical chemistry.

Coastal Zone Management—The applicant should have an undergraduate major in one of the natural or physical sciences or engineering with course work to include computer science, mathematics through calculus, chemistry, physics, and biology or geology.

Geological—The applicant should have an undergraduate major in physical or natural science or engineering. The background should include computer science, mathematics through calculus and at least one year each of chemistry and physics. The geological background should include mineralogy, petrology, sedimentation and stratigraphy.

Physical—The applicant should have an undergraduate major in physics, mathematics, physical science or engineering. The background should include computer science, at least one year of chemistry, mathematics through differential equations, statistics, thermodynamics and fluid mechanics.

Degree Requirements

The Master of Science in Oceanography is conferred upon students who have successfully completed a minimum of 30 credit hours (including thesis, if required) of required and elective course work.

Curriculum

To earn the master of science degree, the student must complete the following courses or their equivalents. Equivalent course work can be substituted for required courses as recommended by the student's adviser and program chair. Representative electives for each option are available from advisers. At least six credits of thesis or internship is required, and an additional three credits can be granted in place of the three credits of elective, subject to approval by the program chair.

OCN 5101 Principles of Biological Oceanography	3
OCN 5210 Marine and Environmental Chemistry	3
OCN 5301 Principles of Geological Oceanography	3
OCN 5401 Principles of Physical Oceanography	3
OCN 5990 Oceanography Seminar	0
Elective	3
Option Requirements	15
TOTAL CREDITS REQUIRED	30

Option Courses (15 credits)

Biological

OCN 5709 Numerical Analysis of Biological Data	3
Two of the following three courses:	
OCN 5102 Marine Phytoplankton	3
OCN 5103 Marine Zooplankton	3
OCN 5104 Marine Benthos	3
Thesis	6

Chemical

Electives	9
Thesis	6

Coastal Zone Management

OCN 5801 Coastal Systems Planning	3
Internship	6
Electives	6

Geological

OCN 5304 Coastal and Estuarine Processes	3
Electives	6
Thesis	6

Physical

OCN 5403 Ocean Wave Theory	3
OCN 5405 Dynamic Oceanography	3
OCN 5409 Geophysical Fluid Dynamics	3
Thesis	6

Doctor of Philosophy Degree Program

The doctor of philosophy degree is offered to students who want to carry out advanced research in an area of existing faculty expertise. The doctoral degree is granted in recognition of high achievement in a program of study, required examinations and original research in the field of oceanography. Students may be admitted during any semester, but for optimal scheduling the fall semester is recommended.

Admission Requirements

An applicant who has received a bachelor's or master's degree in mathematics, natural science, engineering or related fields is eligible to apply for admission to the doctoral program. All applicants should have a high scholastic record (minimum of 3.3 GPA based on a 4.0 scale), three letters of recommendation and Graduate Record Examination General Test scores. Included with the application should be a short, clear statement of the applicant's interests and objectives. Although nor required for admission, an on-campus interview is highly recommended.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The doctoral degree is primarily a research degree and is conferred in part in recognition of research accomplishments. Each student must complete an approved program of course work; demonstrate proficiency in a foreign language or a computer language, at the discretion of the doctoral committee; pass the comprehensive examinations; write an acceptable research proposal and petition for admission to candidacy; complete a program of significant original research; prepare and defend a dissertation concerning the research; and present a seminar on the research. Each candidate is expected to publish a major portion of the dissertation in refereed national or international journals. A minimum of 24 credit hours of course work and 24 credit hours of dissertation beyond a master's degree are required.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

A program of study must be approved by the student's adviser and the program chair. A wide degree of latitude is allowed in course selection and research interest within the capability of the university and the student's academic background. A student in one of the five concentrations available (biological, chemical, coastal zone management, geological and physical) must also develop a general knowledge of the various areas of oceanography.

Prior to admission to doctoral candidacy, the student may be required to demonstrate proficiency in a computer language or a reading proficiency of scientific literature in one foreign language. The chosen language should allow access to important literature in the student's area of research. This requirement is imposed at the discretion of the doctoral committee.

After admission to doctoral candidacy, a yearly seminar demonstrating progress must be presented to the graduate faculty.

Research Activities and Facilities

Research activities in the department are diverse and vary with increased knowledge from current research, changes in demands in the research community and new developments in experimental procedures and instrumentation. Separate laboratories exist for biological, chemical, physical, geological and instrumentation investigations.

Biological Oceanography
The major emphasis in this lab is directed toward pelagic and benthonic investigations. Available equipment for student and research needs include fluorometers, collection nets, trawls, grabs, and photographic and microscopic instruments. A controlled environmental room is operated within this laboratory.

Chemical Oceanography
This laboratory is equipped to enable both routine and research-level analyses on open ocean and coastal lagoonal waters. Major and minor nutrients, heavy-metal contaminants and pollutants can be quantitatively determined.

Analytical instruments include scintillation counters, organic carbon analyzers, fluorescence spectrometers, ultraviolet and visible light spectrophotometers, an atomic absorption spectrometer and field measurement equipment. Equipment for investigation of physical chemistry of seawater is also available.

Marine Geology and Geophysics Laboratory
This 1,000-sq.-ft. laboratory contains state of the art equipment for the compositional and textural analysis of sediment and water samples, including a rapid sediment analyzer and computer-assisted sieve stations. High- and low-temperature ovens, PC-based computer workstations and suspended sediment filtration systems are also available. In addition, the lab houses vibracore and sediment grab sampling equipment.

Physical Oceanography
The Physical Oceanography Laboratory supports graduate research in ocean waves, coastal processes, circulation and pollutant transport. In addition, current meters, tide and wind recorders, salinometers, wave height gauges, a side-scan sonar, CTD system and other oceanographic instruments are available.

Ocean Engineering
Ocean Engineering facilities support both traditional design activities and computer-aided design. The Engineering Test Laboratory has facilities for structural and pressure testing and a small wave tank.

Evinrude Marine Operations Center and Research Vessels
The Ralph S. Evinrude Marine Operations Center facility houses small outboard-powered craft and medium-sized workboats. These vessels are available to students and faculty for teaching and research use in the freshwater tributaries and the lagoon. The 60-ft. *R/V Delphinus* is berthed at Port Canaveral. With her own captain and a well-developed research program, she is the focal point of research in the Indian River Lagoon and coastal areas, as well as teaching in oceanography.

Vero Beach Marine Laboratory
An oceanfront marine research facility, owned and operated by Florida Tech, is located at Vero Beach, just 40 minutes from campus. Laboratory and office space total approximately 4,500 square feet. Flowing seawater allows research in such areas as aquaculture, biofouling and corrosion.

Harbor Branch Oceanographic Institution
The department maintains a close working relationship with Harbor Branch Oceanographic Institution (HBOI), located about an hour from campus between Vero Beach and Fort Pierce. Scientists and engineers from HBOI interact with Florida Tech's students and faculty and make their facilities and expertise available in directing student research.

Indian River Marine Science Platform
A platform has been established in the Indian River Lagoon for instrumentation and research.

Midwest Research Institute, Palm Bay Laboratories
Florida Tech cooperates with MRI, Florida, in the use of state-of-the-art analytical instrumentation. Current areas of research at this center (eight miles south of Florida Tech's main campus) include inductively coupled argon plasma mass spectrometry (ICP/MS) and scanning electron microscopy (SEM).

Surf Mechanics Laboratory
A 200-foot glass wave channel, one of the largest built to date, supports teaching and research in wave mechanics, marine hydrodynamics and coastal processes.

Software Engineering

DEPARTMENT OF COMPUTER SCIENCES
W.D. Shoaff, Ph.D., Head

Bachelor of Science *Master of Science*

Professors
Cem Kaner, Ph.D., *software testing, computer law.*

J. Richard Newman, Ph.D., *computer graphics, information resource management, multimedia distant learning, computer law and ethics.*

James A. Whittaker, Ph.D., *statistical testing of software, information assurance.*

Associate Professors
Phil J. Bernhard, Ph.D., *database systems, software engineering.*

Walter P. Bond, Ph.D., *operating systems, systems performance analysis, software engineering processes.*

William D. Shoaff, Ph.D., *computer graphics, analysis of algorithms, mathematical software.*

Assistant Professor
Mike Andrews, Ph.D., debugging tools.

Adjunct Professors
A.A. Jorgensen, Ph.D.; V.J. Kovarik, Ph.D.

Lecturer
L. Bearden, M.S.

Student Coordinator
Rosalyn Bursey

The mission of Florida Tech's computer sciences department is to pursue knowledge, truth and excellence in computer science, information systems and software engineering by nurturing student-centered academic programs characterized by shared values, unity of purpose, diversity of opinion, mutual respect and social responsibility. We are committed to expanding our range of disciplines through a well-funded and renowned research program, and to the continual improvement of the quality of our degree programs.

Bachelor of Science Degree Program

The objectives of the software engineering bachelor of science program is to graduate students who have a strong technical background in computer science and software engineering; who are good communicators and team members; who are able to develop and use a variety of systems and software applications; and who have positive attitudes toward the computing profession and a desire for lifelong learning.

The software engineering program prepares students for careers as practicing professionals in software design and implementation, and for graduate study. The engineering of software is multi-disciplinary, spanning computer science, engineering economics, engineering problem solving, epistemology, human factors management, mathematics, quality control and safety.

Because the subject matter of programming, algorithms and data structures forms a critically important foundation for all advanced computer science and software engineering courses, the minimum grade for satisfying the prerequisite requirements for these advanced courses is a grade of C for each of the following courses: CSE 1001, CSE 1002 and CSE 2010.

Candidates for a Bachelor of Science in Software Engineering must complete the minimum course requirements outlined in the following curriculum.

Freshman Year

FALL		CREDITS
COM	1101 Composition and Rhetoric	3
CSE	1001 Fundamentals of Software Development 1	4
CSE	1101 Computing Disciplines and Careers 1	1
MTH	1001 Calculus 1	4
MTH	2051 Discrete Mathematics	3
		15

SPRING		
COM	1102 Writing about Literature	3
CSE	1002 Fundamentals of Software Development 2	4
HUM	2510 Logic	3
MTH	1002 Calculus 2	4
PSY	1411 Introduction to Psychology	3
		17

Sophomore Year

FALL		CREDITS
COM	2223 Scientific and Technical Communication	3
CSE	2010 Algorithms and Data Structures	4
CSE	3411 Software Testing 1	3
PHY	1001 Physics 1	4
PHY	2091 Physics Lab 1	1
		15

SPRING		
CSE	2050 Programming in a Second Language	3
CSE	2410 Introduction to Software Engineering	3
MTH	2401 Probability and Statistics	3
PHY	2002 Physics 2	4
PHY	2092 Physics Lab 2	1
	Restricted Elective (Science)	3
		17

Junior Year

FALL		CREDITS
COM	2012 Research Sources and Systems	1
CSE	3101 Machine and Assembly Language	3
CSE	4415 Software Testing 2	3
CSE	4621 Software Metrics and Modeling	3
HUM	2051 Civilization 1	3
	Restricted Elective (Science)	3
		16

SPRING		
AHF	3101 Introduction to Human Factors	3
CSE	3030 Legal, Ethical and Social Issues in Computing	3
CSE	3421 Software Design Methods	3
CSE	4610 Requirements Engineering	3
HUM	2152 Civilization 2	3
	Free Elective	3
		18

Senior Year

FALL		CREDITS
CSE	4001 Operating Systems Concepts	3
CSE	4201 Software Development Projects 1	3
CSE	xxxx Restricted Elective (Computer Science)	3
	Social Science Elective	3
	Free Elective	3
		15

SPRING		
CSE	4083 Formal Languages and Automata Theory	3
CSE	4202 Software Development Projects 2	3
CSE	xxxx Restricted Elective (Computer Science)	3
	Humanities Elective	3
	Free Elective	3
		15

TOTAL CREDITS REQUIRED 128

Master of Science Degree Program

The master of science program in software engineering primarily serves working software engineers who want to broaden their perspectives while deepening their skills in software development. The program also accepts students who are already competent programmers and who want to prepare for careers in software engineering. Courses in this program are taught at a level that assumes all students have technical undergraduate degrees and significant programming experience.

Admission Requirements

A bachelor's degree in computer science or a related discipline is required. Specific skills include mastery of at least one programming language and the content of CSE 2010 (Algorithms and Data Structures) and MTH 2051 (Discrete Mathematics), as well as at least two computer science courses at the level of Florida Tech's CSE 3xxx and 4xxx courses. Graduate Record Examination scores (General Test only) are also required.

Degree Requirements

The Master of Science in Software Engineering is offered with both thesis and nonthesis options. Each requires a minimum of 30 credit hours of approved graduate study. Prior to the completion of nine credit hours, the student must submit for approval a program plan to indicate the option chosen and the specific courses to be taken. Up to six credit hours of thesis work may be included in the 30-credit-hour requirement. The nonthesis path requires successful completion of a comprehensive examination.

Curriculum

The master's degree program requires 30 credits, consisting of four required courses, four electives and either a thesis or two additional electives, as follows:

Required Courses

SWE 5001 Software Engineering 1 3
SWE 5002 Software Engineering 2 3
SWE 5411 Software Testing 1 3
SWE 5621 Software Metrics and Modeling 3

Elective Courses

At least one elective must be selected from each of the areas of programming and foundations. Lists of courses satisfying each of these requirements are available upon request. At least one other elective must be a non-required software engineering (SWE) graduate course. Typical courses satisfying the programming requirement are CSE 5232 (Network Programming), CSE 5250 (Programming Languages) and CSE 5280 (Computer Graphics). Typical courses satisfying the foundations requirement are CSE 5210 (Formal Languages and Automata Theory), CSE 5230 (Operating Systems) and CSE 5260 (Database Systems).

Research Activities

Software engineering faculty and students are currently conducting research in the following general areas:

- Computer-aided software engineering
- Formal methods
- Information assurance and computer security
- Software architecture and design
- Software process improvement
- Software reliability engineering
- Software testing methodologies

College of Science and Liberal Arts

Dean Gordon L. Nelson, Ph.D.

Bachelor of Science
Applied Mathematics
Biochemistry
Biological Sciences
- *Aquaculture*
- *Ecology*
- *General Biology*
- *Marine Biology*
- *Molecular Biology*
- *Preprofessional Biology*

Chemistry
- *Chemical Management*
- *General Chemistry*
- *Premedical Chemistry*
- *Research Chemistry*

Communication
Interdisciplinary Science
- *Military Science*

Mathematics Education
Physics
- *Preprofessional Physics*

Science Education
- *Biology*
- *Chemistry*
- *Computer Science*
- *Earth/Space Science*
- *General Science*
- *Physics*

Space Sciences
- *Astronomy/Astrophysics*

Bachelor of Arts
Humanities

Master of Science
Applied Mathematics
Biological Sciences
- *Biotechnology*
- *Cell and Molecular Biology*
- *Ecology*
- *Marine Biology*

Chemistry
Computer Education
Environmental Education
Mathematics Education
Operations Research
Physics
Science Education
Space Sciences
Technical and Professional Communication

Educational Specialist
Mathematics Education
Science Education

Doctor of Education
Mathematics Education
Science Education

Doctor of Philosophy
Applied Mathematics
Biological Sciences
Chemistry
Mathematics Education
Operations Research
Physics
Science Education
Space Sciences

Associate Dean, Academics
Randall L. Alford, Ph.D.

Associate Dean, Research
Terry Oswalt, Ph.D.

Organization
The College of Science and Liberal Arts consists of six degree-granting departments: biological sciences, chemistry, humanities and communication, mathematical sciences, physics and space sciences and science/mathematics education. Degrees in the communication field include undergraduate areas of specialization in both business and professional communication, and scientific and technical communication, as well as a master's degree in technical and professional communication. An interdisciplinary science program administered by the physics and space sciences department allows students to enroll in a wide variety of science and engineering courses, supplemented by certain core courses and several carefully chosen humanities electives. An undergraduate program in biochemistry is administered jointly by the biological sciences and chemistry departments. In addition, a graduate-only program in computer education is offered by the science education department, in cooperation with the computer science program in the College of Engineering; and a graduate-only program in operations research is offered by the mathematical sciences department. A Certificate in Materials Science and Engineering, in conjunction with the Master of Science in Physics, is offered.

Courses in foreign languages and linguistics are offered through the Department of Humanities and Communication's Division of Languages and Linguistics, as well as an intensive English as a Second Language program for students whose first language is not English.

Admission

As a Freshman

All entering students are strongly advised to complete at least one year each of chemistry and physics, two years of algebra, one year of geometry and one-half year each of trigonometry and analytic geometry prior to enrolling. In addition, at least one year of high school biology is needed for students planning to major in biological sciences, chemistry or science education. Familiarity with computers and computer programming is advisable for students in all fields.

Admission decisions are based primarily on grades received in the courses listed above and in English, high school rank in class, grade point average and SAT or ACT scores.

Tests administered to entering freshmen during the week preceding the start of classes each fall semester are designed to identify deficiencies in mathematics and chemistry. Special courses are available for students needing to review these subjects or fill in areas missed in high school before going on to the courses specified in their programs. Tests are also available that allow advanced placement in chemistry, computer science and mathematics. Students who did not take high school physics are allowed to take PHY 1001 but should be prepared to do extra work to keep up with the course material. Students with no prior courses in biology are not permitted to take BIO 1010.

Written and spoken communication is extremely important in all fields of science and liberal arts. Problems with reading comprehension or speed place a student at a disadvantage in successfully completing reading assignments and taking tests. Inability to clearly state complex ideas and technical results in correct written English can result in problems in laboratory courses and other courses where written reports are required. Every effort should be made to correct any weaknesses in these areas either prior to arrival at the university or during the freshman year.

As a Transfer Student

Admission decisions for transfer students are made on the basis of a combination of the criteria used for new freshmen, postsecondary grade point averages and specific course grades that are applicable to the major. Where courses equivalent to at least the first year of the Florida Tech major have been completed, the level of accomplishment in these courses is normally the dominant factor.

Students choosing to attend a community college for two years before transferring to the College of Science and Liberal Arts should be guided by articulation agreements where they exist. The detailed curriculum plan for the desired program should be consulted for more specific guidance. If possible, prospective students should review their community college curriculum periodically with an appropriate university faculty member. Some of the courses normally taken in the first two years of the program of interest may be unavailable at some community colleges. As a result, it may take one or more semesters in addition to the normal two years following community college graduation to complete the desired bachelor's degree program.

Most mathematics, physics, applied mechanics, computer programming and English courses at the first- and second-year levels are offered every semester. Every effort is made to make space for new transfer students in closed sections, if necessary. Transfer students can usually be registered for a full schedule of courses that are tailored to their immediate academic needs. Exceptions, when they occur, are usually the result of the student having completed all course work in some disciplines, such as mathematics and the humanities, without having started course work in other essential areas, such as physics or chemistry.

Courses taken at other fully accredited colleges and universities in the United States or at recognized universities abroad are carefully and thoroughly reviewed for possible award of transfer credit. Except for a student transferring from a Florida community college or other college with which the university has an articulation agreement, the student must provide college catalogs containing descriptions of all courses taken. Course outlines or syllabi are also helpful in assuring that all earned transfer credit is received. In the case of courses taken at a foreign university, detailed course outlines are required for transfer credit. If there is doubt about the equivalency of a course taken elsewhere, the student is required to pass an equivalency examination to receive Florida Tech credit for the course. In any case where transfer credit is not awarded for a course passed at another college or university, the student can request an equivalency examination, if one is available.

Selection of a Major

A student typically selects a major at the time the application for admission is submitted. A faculty adviser affiliated with the major program is assigned prior to the start of classes. A student who prefers to postpone the selection of a major may initially enroll in a first-year nondegree program, as described below. Selection of a degree program must occur by the start of the sophomore year.

As long as the requirements for continued enrollment (see the *Undergraduate Information and Regulations* section) are met, a student is permitted to remain in the selected major. A change of major can be initiated by the student but is subject to the approval of the new academic unit. It is generally possible to change majors between two closely related degree programs in the sophomore year or even during the early part of the junior year without greatly increasing the time needed to complete all degree requirements.

A student who wishes to postpone the selection of a major can enroll for up to two semesters under either a "General Science" (see below) or "General Studies" (see the *Nondegree Programs* section) curriculum. These curricula are designed to be somewhat less intense than the normal freshman curriculum to allow students more time for acclimation to college life.

Course Loads

The normal course load taken by students in the College of Science and Liberal Arts is between 16 and 17 credit hours. Students can enroll for lighter loads and are strongly encouraged to do so if difficulty is experienced in keeping up with

all course work when a full load is attempted, even though the duration of the program would, of necessity, be extended from eight to nine or more semesters. A student registered for 12 or more credit hours is considered full time. Students with cumulative grade point averages below 2.0 are not allowed to register for more than 15 credit hours in a semester.

Cooperative Education

Students in some curricula in the College of Science and Liberal Arts are encouraged to participate in the cooperative education program, although the availability of co-op employment opportunities varies considerably from field to field. By alternating periods of work experience in their chosen fields with academic semesters spent on campus as full-time students, participants in this program are able to earn funds needed to further their education while gaining valuable practical experience and a knowledge base that is useful in better defining career goals. The length of time needed to earn the degree is extended by an amount comparable to the number of semesters spent away from the campus. Students in this program should pay special attention to scheduling their courses well in advance to avoid conflicts between off-campus periods and the semesters when required courses are offered.

General Science

ASSOCIATE DEAN, ACADEMICS
Randall L. Alford, Ph.D.

A student who wishes to postpone the selection of a major may enroll for up to one year as a general science student, following the curriculum described below. This curriculum is designed to allow students more time to become familiar with programs in the life sciences and physical sciences offered by the College of Science and Liberal Arts. Students may need to make up some credits later on—eight or fewer in most cases if they follow the general science curriculum and make the appropriate choice between biology and physics. Students are urged to transfer to degree programs as early as possible.

General Science

FALL	CREDITS
BIO 1010 Biological Discovery 1	4
CHM 1101 General Chemistry 1	4
COM 1101 Composition and Rhetoric	3
MTH 1001 Calculus 1	4
	15

SPRING	
BIO 1020 Biological Discovery 2	4
or	
PHY 1001 Physics 1	4
CHM 1102 General Chemistry 2	4
COM 1102 Writing about Literature	3
MTH 1002 Calculus 2	4
	15

Students in this program are advised by the chemistry department head until a degree program is selected. Once 30 credit hours (not including remedial courses) have been successfully completed, continued registration is contingent on selection of a degree program. Acceptance into the desired degree program is automatic unless the student has been academically dismissed.

Applied Mathematics

DEPARTMENT OF MATHEMATICAL SCIENCES
V. Lakshmikantham, Ph.D., Head

Bachelor of Science *Master of Science* *Doctor of Philosophy*

Associate Head
Michael D. Shaw, Ph.D.

Professors
Ravi P. Agarwal, Ph.D., *numerical analysis, differential and difference equations, differential inequalities, fixed point theorems.*

Jewgeni H. Dshalalow, Dr. Sci., *real analysis, operations research, stochastic processes, queuing theory.*

Charles T. Fulton, Ph.D., *ordinary and partial differential equations, spectral theory of differential operators, numerical linear algebra, numerical methods for two-point boundary value problems, parallel processing.*

V. Lakshmikantham, Ph.D., *nonlinear analysis, differential and integral equations, numerical mathematics, evolution operations.*

Kamel Rekab, Ph.D., *sequential analysis, design of experiments, applied data analysis, reliability theory.*

Associate Professors
Martin Bohner, Ph.D., *time scales, linear dynamic systems, eigenvalue problems, variational analysis.*

Dennis E. Jackson, Ph.D., *partial differential equations, scattering theory.*

Cecilia A. Knoll, Ph.D., *calculus mastery program, differential equations, integrating technology into the curriculum.*

Semen Koksal, Ph.D., *stability analysis by Lyapunov's direct method, theory of nonlinear ordinary differential equations.*

Kanishka Perera, Ph.D., *variational and topological methods for nonlinear partial differential equations, infinite dimensional Morse theory.*

Michael D. Shaw, Ph.D., *nonlinear differential equations, Lyapunov stability theory, variation of parameters methods, initial time difference.*

Visiting Associate Professors
Snezhana G. Hristova, Ph.D., *theory of differential equations, approximation theory, integral and differential inequalities, impulsive systems, dynamical systems, modeling.*

Gnana Tenali, Ph.D., *nonlinear boundary value problems, wavelet methods, partial differential equations, nonsmooth analysis.*

Assistant Professors
Bradford D. Allen, Ed.D., *statistical research methodology, testing and evaluation, modeling.*

Jay J. Kovats, Ph.D., *elliptic and parabolic partial differential equations.*

Instructor
R.C. Randolfi, M.S.

Professors Emeriti
George E. Abdo, Ph.D.; Frank C. DeSua, Ph.D.

Bachelor of Science Degree Program

During the first two years, mathematics majors share many courses with other students. The mathematics curriculum includes courses with extensive theoretical content, as well as applied courses from related departments. Students can choose electives that will enable them to apply mathematics to engineering, the physical sciences, biological sciences, environmental studies, social sciences and business applications. Mathematics graduates who have successfully completed the program are prepared to pursue graduate work or take their place in industry along with engineers and scientists.

Degree Requirements

Required Courses

Mathematics

MTH 1001 Calculus 1	4
MTH 1002 Calculus 2	4
MTH 2001 Calculus 3	4
MTH 2051 Discrete Mathematics	3
MTH 2201 Differential Equations/Linear Algebra	4
MTH 2401 Probability and Statistics	3
MTH 3102 Introduction to Linear Algebra	3
MTH 4101 Introductory Analysis	3
MTH 4201 Models in Applied Mathematics	3
MTH 4311 Numerical Analysis	3
	34

Computer Science

CSE 1502 Introduction to Software Development with C++	3
CSE 1503 Introduction to Software Development with FORTRAN	3
CSE 2502 Advanced Software Development with C++	3
	9

Communication and Humanities Core

COM 1101 Composition and Rhetoric	3
COM 1102 Writing about Literature	3
COM 2223 Scientific and Technical Communication	3
HUM 2051 Civilization 1	3
HUM 2052 Civilization 2	3
	15

Science

CHM 1101 General Chemistry 1	4
CHM 1102 General Chemistry 2	4
PHY 1001 Physics 1	4
PHY 2002 Physics 2	4
PHY 2091 Physics Lab 1	1
PHY 2092 Physics Lab 2	1
	18

Electives

Mathematics	12
Humanities	3
Social Science	3
Liberal Arts	3
Applied Area	9
Technical Electives	9
Free Electives	6
	45

TOTAL CREDITS REQUIRED 121

Note: Upper-division math courses may be offered in alternate years. Positioning of electives is unrestricted.

Elective Restrictions

Choices of electives are subject to approval by the student's adviser. Math electives must include at least one proof-based course in addition to the required courses in discrete math and analysis. Examples of suitable courses include MTH 4015 (Abstract Algebra), MTH 4105 (Topology) and MTH 4801 (Advanced Geometry).

Applied area electives must be taken from a single area of application. Typically, this means from a single department or program other than mathematics. Any science or engineering program can be chosen. Suitably chosen management courses (courses with math prerequisites) can also be taken.

At least 30 elective credits must be at the 3000+ level.

Master of Science Degree Program

The master's degree program in mathematics is designed to produce mathematicians with competence in analysis who have breadth and versatility in mathematics and its applications in related fields. To this end, students entering the master's program in mathematics are required to select an applied field in which they wish to develop some expertise and to complete six credits toward the degree from approved courses outside the math curriculum. In addition, the master's program is organized so that students will have the freedom to select some of their mathematics electives to develop their own special interests and to complement their choice of applied field. The flexibility in the elective part of the curriculum allows some students the opportunity to achieve a breadth of experience in mathematics and its uses in physical and engineering sciences, computer science or operations research. At the same time, it will allow other students to achieve more knowledge in a particular area in which they may wish to develop expertise. In either case, the program is organized to help students obtain an appropriate background for industrial employment or to pursue further graduate studies toward the doctoral degree. In either case, students will benefit from the range of options that are available in the mathematics master's program.

Students are encouraged to consider which combinations of elective mathematics courses are appropriate for their choice of applied specialization and to discuss the program with their advisers as soon as graduate study begins.

Admission Requirements

Applicants should have the equivalent of an undergraduate major in mathematics and must have completed undergraduate courses in differential equations and statistics, and have proficiency in FORTRAN or C. (Programming languages are noncredit courses for graduate mathematics students.) Applications from graduates with undergraduate majors in the physical sciences or graduate students seeking a second master's degree are welcome. In such cases, however, it may be necessary for applicants to take courses in addition to the 36-credit degree requirement in those subjects where their backgrounds are deficient.

Degree Requirements

The master of science degree in mathematics requires a minimum of 36 credit hours of work beyond the bachelor's degree. For the thesis option, six hours of thesis are required. The thesis should demonstrate the candidate's abilities in the areas of reading and understanding mathematical literature, independent learning and written expression. Theses that combine mathematics with its applications in a related field are encouraged. A nonthesis option candidate must successfully complete an oral comprehensive examination.

Curriculum

Core Areas

Linear Algebra 3
Real Analysis 3
Complex Analysis 3
Numerical and Computational Mathematics 3
Probability and Statistics 3
Differential Equations 3

Elective Courses

Twelve credit hours are to be devoted to elective courses in mathematics or in other scientific or engineering courses with a high degree of mathematical content. Six credit hours of electives can be devoted to writing a thesis. The selection of elective courses must have the faculty adviser's approval.

Applied Field

Six credit hours are to be devoted to the applied field requirement. This requirement consists of courses outside the mathematics program. The applied field courses must be at the 5000-level or above. The selection of applied field courses must have the faculty adviser's approval. Normally, only those subjects involving an appropriate degree of mathematical content are approved as applied field courses in a mathematics program.

Master's Thesis

Six credit hours of electives may be devoted to writing a thesis. The thesis is expected to be completed in two terms. The master's thesis in mathematics is expected to be a thorough investigation of a well-defined problem.

Doctor of Philosophy Degree Program

The doctoral program in mathematics is designed to produce a mathematician with a broad background in analysis and a strong field of specialization in either nonlinear analysis, applied analysis, or numerical analysis and scientific computing. This combination of training will prepare the student for a career in a variety of areas, such as government or industrial research, or academic research and teaching. Doctoral graduates have the necessary experience in areas of application to be able to work successfully with other members of multidisciplinary research teams. Graduates also have the critical ability to think independently and analytically. They are able to make significant contributions to knowledge in their chosen fields of inquiry.

A preliminary program of study should be prepared by the student and adviser during the first semester of graduate studies. The final doctoral program of study must be approved by the student's advisory committee and program chair.

Admission Requirements

Applicants for the doctoral program in mathematics usually have a bachelor's or master's degree in mathematics. However, applications are also invited from graduates in physical and engineering sciences. In these cases, necessary undergraduate courses have to be taken to remove deficiencies before the student enters the doctoral program. In evaluating international applicants, due consideration is given to academic standards in the country in which the graduate studies were performed. Graduate teaching assistants carry on a variety of teaching assignments and in view of this, evidence of good English-speaking skills is an important criterion in processing the applications. For admission, a student should have a superior academic record and letters of recommendation. Preference will be given to applicants who have good scores on the Graduate Record Examination.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The degree of doctor of philosophy (Ph.D.) is conferred primarily in recognition of the breadth of scientific accomplishment and of the power to investigate scientific problems independently, rather than for the completion of a definite course of studies. Although demanding a strong mathematical orientation, the doctoral program in mathematics does not fall within the traditional boundaries of a single academic unit and the scope is quite broad. Consequently, every course in a student's program of study is evaluated not only as to content, but also the way in which it complements other courses and furnishes breadth and depth to the program. The work should consist of advanced studies and scientific research that lead to a significant contribution and knowledge of a particular area.

Each student must pass a preliminary examination covering the core courses, complete an approved program of studies, pass the comprehensive examination (usually oral), complete a program of significant original research work and defend a dissertation concerning the research work completed.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

After a bachelor's degree in mathematical sciences, a minimum of 81 credit hours is required for the doctoral program, including the courses listed below:

Core Areas (30 credit hours)

Linear Algebra 3
Real and Complex Variables 9
Numerical and Computational Mathematics 6
Probability and Statistics 6
Differential Equations 6

Areas of Specialization (21–27 credit hours)

Nonlinear Analysis
Stochastic Analysis
Optimization
Numerical Analysis and Scientific Computing
Statistics

Considerable flexibility is allowed in the selection of courses in core areas and areas of specialization. Selected course offerings from the mathematics department and other areas of science and engineering may be taken to fulfill the requirements.

Doctoral Dissertation

The dissertation consists of 24–30 credit hours of work and is expected to be completed within two years. The doctoral dissertation is expected to represent original research in mathematics. It may present new theoretical developments or new areas of application or both. The dissertation should contain results that constitute a significant contribution to the literature of the field of investigation. These results should be worthy of publication in an established technical journal.

Research Activities

Active areas of research in the mathematics program include methods of nonlinear analysis, qualitative and quantitative properties of nonlinear evolution equations (including differential equations with delay), integro-differential equations and stochastic differential equations, spectral theory of operators, reaction-diffusion equations, approximation theory, applied statistics, sequential analysis, mathematical programming, combinatorial optimization, operations research, queuing theory, stochastic processes, mathematical modeling, neural networks, numerical and computational mathematics with emphasis on numerical methods for ordinary and partial differential equations, numerical algorithms and parallel processing.

Biochemistry

BIOLOGICAL SCIENCES AND CHEMISTRY DEPARTMENTS

Bachelor of Science

Co-Chairs

Michael W. Babich, Ph.D., Head, Department of Chemistry

Gary N. Wells, Ph.D., Head, Department of Biological Sciences

Professors

Michael W. Babich, Ph.D., *solid-state chemistry, including X-ray crystallographic structure determination, mechanisms of reactions in solids, kinetic investigations of coordination complexes, thermal analysis.*

Alan C. Leonard, Ph.D., *molecular biology, microbial growth control, DNA replication, superhelicity and methylation as regulators of DNA bioreactivity, DNA-protein interactions.*

Joshua Rokach, Ph.D., *leukotrienes, lipoxins, synthetic organic chemistry, synthetic pharmaceuticals.*

Mary L. Sohn, Ph.D., *nature of sedimentary humic acids in aquatic sediments, evaluation of humic acid-metal and humic acid-organometallic formation constants.*

Gary N. Wells, Ph.D., *protein biochemistry, molecular biology of development.*

Associate Professors

J. Clayton Baum, Ph.D., *molecular spectroscopy, including photophysical and photochemical problems and energy transfer and relaxation processes; molecular orbital calculations.*

Alan B. Brown, Ph.D., *physical organic chemistry, stereochemistry, bioorganic chemistry.*

Michael S. Grace, Ph.D., *molecular control of photoreceptors in the retina and nonretinal photoreceptors of the brain, pineal and parietal organ.*

Julia E. Grimwade, Ph.D., *DNA replication, DNA-protein interaction, bacterial cell cycle control, antibiotic discovery.*

Charles D. Polson, Ph.D., *application and development of biotechnology in undergraduate education, nucleic acid analysis, electrophoretic separation.*

Russell C. Weigel, Ph.D., *plant physiology, plant tissue culture.*

Assistant Professors

David J. Carroll, Ph.D., *molecular basis of signal transduction at fertilization.*

Mark J. Novak, Ph.D., *biocatalysis, enzyme assisted sythensis, metabolic studies of chemical and biological warfare agents.*

Biochemists, in studying all kinds of living organisms including viruses, bacteria, fungi, plants and animals (including humans), have found that many of the fundamental biochemical properties of living systems are shared throughout the hierarchy of life-forms. Because biochemists try to unravel the complex chemical reactions that occur in such a wide variety of life forms, biochemistry provides the basis for practical advances in medicine, veterinary medicine, agriculture and biotechnology. Biochemistry underlies and includes such fields as molecular biology and bioengineering. As the broadest of the basic sciences, biochemistry includes many subspecialties, such as inorganic biochemistry, bioorganic chemistry, physical biochemistry, biochemical and molecular genetics, biomedical pharmacology and immunochemistry. Recent advances in many areas of biochemistry have created links among technology, chemical engineering and biochemistry. More than ever, this is the age of biochemistry because the techniques of so many different disciplines can now be applied in studying the chemistry of living systems.

Career opportunities for biochemists are rapidly expanding in the areas of agricultural research, biotechnology firms, governmental laboratories, industrial research and development and research institutes, as well as university research and teaching. Far-reaching advances in many areas of basic and applied research are projected over the next few years. These areas include plant genetics; the biochemistry of cell receptors for hormones and neurotransmitters; the diagnosis and treatment of disease, particularly inherited diseases; and toxicology. All require an understanding of biochemistry and the use of biochemical techniques.

Organization

The course of study leading to a Bachelor of Science in Biochemistry is an interdisciplinary program jointly administered by the Department of Biological Sciences and the Department of Chemistry. The curriculum has flexibility in that technical electives can be selected to provide a strong emphasis in either biology or chemistry and prepare the biochemistry major for a variety of careers. All students take a core curriculum of basic science and mathematics during the first two years. During the junior and senior years, students take many specialized courses that reflect their choice of emphasis between biology and chemistry.

Students entering the biochemistry program as freshmen will normally be assigned faculty advisers in the department of chemistry. A student selecting an upper-division curriculum with a biological emphasis should indicate this intention by the beginning of the second semester of the sophomore year, at which time a new faculty adviser in the department of biological sciences will be assigned. A student's request for a change of advisers from chemistry to biology, or vice versa, will be honored at any time during the program.

Admission

Students intending to apply for admission to study for a Bachelor of Science in Biochemistry should elect at least one year each of high school biology, chemistry and physics. Prospective students should also have at least three years of high school mathematics, including second-year algebra and trigonometry.

Florida Institute of Technology has articulation agreements with many of the community colleges in Florida. Students contemplating transfer to Florida Tech should consult with their counselors to determine transferability of community college credits. If there is a question regarding specific courses needed, either of the biochemistry program chairs listed above should be contacted.

Degree Requirements

Candidates for a Bachelor of Science in Biochemistry must complete the minimum course requirements as outlined in the following curriculum. Electives are selected in consultation with the faculty adviser to reflect the knowledge a student needs either for employment or graduate school. Deviation from the stipulated program may occur only under unusual circumstances and requires approval of the chair. The bachelor's degree in biochemistry requires 128 credit hours for graduation.

Freshman Year

FALL	CREDITS
BIO 1010 Biological Discovery 1	4
CHM 1101 General Chemistry 1	4
COM 1101 Composition and Rhetoric	3
MTH 1001 Calculus 1	4
	15
SPRING	
BIO 1020 Biological Discovery 2	4
CHM 1102 General Chemistry 2	4
COM 1102 Writing about Literature	3
MTH 1002 Calculus 2	4
	15

Sophomore Year

FALL	CREDITS
BIO 2110 General Genetics	4
CHM 2001 Organic Chemistry 1	3
CHM 2011 Organic Chemistry Lab 1	2
MTH 2001 Calculus 3	4
PHY 1001 Physics l	4
PHY 2091 Physics Lab 1	1
	18
SPRING	
CHM 2002 Organic Chemistry 2	3
CHM 2012 Organic Chemistry Lab 2	2
CSE 1503 Introduction to Software Development with FORTRAN	3
HUM 2051 Civilization 1	3
PHY 2002 Physics 2	4
PHY 2092 Physics Lab 2	1
	16

Junior Year

FALL	CREDITS
COM 2223 Scientific and Technical Communication	3
HUM 2052 Civilization 2	3
Program Core Course (BIO, CHM)	4–5
Restricted Elective (BIO, CHM)	3
Technical Elective	3
	16–17
SPRING	
MTH 2401 Probability and Statistics	3
Program Core Course (BIO, CHM)	4–5
Humanities Elective	3
Restricted Elective (BIO, CHM)	4
	14–15

Senior Year

FALL	CREDITS
Program Core Course (BIO, CHM)	5–4
Liberal Arts Elective	3
Restricted Electives (BIO, CHM)	6
Social Science Elective	3
	17–16
SPRING	
Program Core Course (BIO, CHM)	5–4
Liberal Arts Elective	3
Restricted Electives (BIO, CHM)	6
Free Elective	3
	17–16

TOTALS CREDITS REQUIRED 128

Program Core Courses by Emphasis

Biological Sciences

Junior Year

FALL
BIO 4010 Biochemistry 1

SPRING
BIO 4110 Biochemistry 2

Senior Year

FALL
CHM 3001 Physical Chemistry 1
CHM 3011 Physical Chemistry Lab 1

SPRING
CHM 3002 Physical Chemistry 2
CHM 3012 Physical Chemistry Lab 2

Chemistry

Junior Year

FALL
CHM 3001 Physical Chemistry 1
CHM 3011 Physical Chemistry Lab 1

SPRING
CHM 3002 Physical Chemistry 2
CHM 3012 Physical Chemistry Lab 2

Senior Year

FALL
BIO 4010 Biochemistry 1

SPRING
BIO 4110 Biochemistry 2

Restricted Electives

Biological Sciences

BIO 2010 Microbiology 4
BIO 3210 Mammalian Physiology 4
BIO 3220 Developmental Biology 4
BIO 4101 Molecular Biology 3
BIO 4120 Genetic Engineering Techniques 4
BIO 4130 Nucleic Acid Analysis 4
BIO 4201 Immunology 3
BIO 4210 Plant Physiology 4
BIO 4301 Cell Biology 3

Chemistry

CHM 3301 Analytical Chemistry 1 3
CHM 3302 Analytical Chemistry 2/Instrumentation 3
CHM 3311 Analytical Chemistry 1 Lab 2
CHM 3312 Analytical Chemistry 2/Instrumentation Lab 2
CHM 4001 Inorganic Chemistry 1 3
CHM 4002 Inorganic Chemistry 2 3
CHM 4111 Advanced Physical Chemistry 3
CHM 4304 Advanced Analytical Chemistry 3
CHM 4500 Advanced Organic Chemistry 3
CHM 4550 Polymer Chemistry 3
COM 2012 Research Sources and Systems 1

Senior Thesis

The biochemistry curriculum allows for significant undergraduate research experience, culminating in a senior thesis for those students who wish to pursue postgraduate studies and are maintaining a grade point average of 3.0 or better in all science and mathematics courses. A qualified student wishing to participate in the senior thesis program must notify the appropriate department (either biological sciences or chemistry, depending on the student's research interests and curriculum emphasis) no later than the end of the fall semester of the junior year. A thesis committee, consisting of one or more faculty members from each department, will be formed to consider the thesis proposal, which must be submitted during the spring semester of the junior year. After the approval of the senior thesis committee and the appropriate department head, based on both the proposal and the student's academic record, the student will be permitted to register for Senior Thesis in Biochemistry (BCM 4991 and BCM 4992) during the senior year. These courses and COM 2012, Research Sources and Systems, represent seven semester hours of restricted electives toward meeting the degree requirements listed above. Senior Thesis in Biochemistry students are encouraged to include at least one year of foreign language (French or German) in their degree programs.

Biological Sciences

DEPARTMENT OF BIOLOGICAL SCIENCES
G.N. Wells, Ph.D., Head

Bachelor of Science
Options in:
Aquaculture
Ecology
General Biology
Marine Biology
Molecular Biology
Preprofessional Biology

Master of Science
Options in:
Biotechnology
Cell and Molecular Biology
Ecology
Marine Biology

Doctor of Philosophy

(For related degree programs, see the Oceanography section of this catalog.)

Associate Department Heads
John G. Morris, Ph.D., Director of Graduate Programs

Richard L. Turner, Ph.D., Director of Undergraduate Programs

Professors
Charles E. Helmstetter, Ph.D., *regulation and control of cell division, molecular biology of the cell cycle.*

Alan C. Leonard, Ph.D., *molecular biology, microbial growth control, DNA replication, superhelicity and methylation as regulators of DNA bioreactivity, DNA-protein interactions.*

Junda Lin, Ph.D., *molluscan and crustacean aquaculture.*

Gary N. Wells, Ph.D., *protein biochemistry, molecular biology of development.*

Associate Professors
Mark B. Bush, Ph.D., *paleoecology, biogeography, Amazonian speciation, tropical conservation, wetland ecosystems.*

Michael S. Grace, Ph.D., *molecular control of photoreceptor in the retina and nonretinal photoreceptors of the brain, pineal and parietal organ.*

Julia E. Grimwade, Ph.D., *DNA replication, DNA-protein interaction, bacterial cell cycle control, antibiotic discovery.*

John G. Morris, Ph.D., *population ecology of selected mammalian and avian species, with emphasis on endangered species.*

Charles D. Polson, Ph.D., *application and development of biotechnology in undergraduate education; nucleic acid analysis, electrophoretic separation.*

Jonathan M. Shenker, Ph.D., *finfish aquaculture, biology and ecology of early life stages of fishes, environmental toxicology.*

Richard A. Tankersley, Ph.D., *ecology, physiology and behavior of marine and freshwater invertebrates.*

Ralph G. Turingan, Ph.D., *vertebrate functional morphology, community structure of fishes, ecological morphology of feeding systems.*

Richard L. Turner, Ph.D., *reproduction and life histories of marine organisms, physiological ecology of marine organisms, general biology of echinoderms.*

Russell C. Weigel, Ph.D., *plant physiology, plant tissue culture.*

Robert van Woesik, Ph.D., *population and community ecology of coral reefs, emphasis on mechanisms underlying large scale patterns in coral community structure and diversity.*

Assistant Professor
David J. Carroll, Ph.D., *molecular basis of signal transduction at fertilization.*

Research Professors
Arvind M. Dhople, Ph.D., *microbiology and physiology of M. leprae, causative agent of human leprosy.*

John J. Thomas, Ph.D., *bioenergy and technology, alternate fuels from biological sources.*

Institutional Associate Faculty
B.G. Calman, Ph.D.; C. Cook, Ph.D.; S. Cook, Ph.D.; M. Davis-Hodgkins, Ph.D.; T. Frank, Ph.D.; R.G. Gilmore, Ph.D.; M.D. Hanisak, Ph.D.; J.V. Lopez, Ph.D.; P.M. Mikkelsen, Ph.D.; G.A. Nelson, Ph.D.; R. Paperno, Ph.D.; S. Pomponi, Ph.D.; W. Safranek, Ph.D.; J. Scarpa, Ph.D.; H. Swain, Ph.D.; J.W. Tucker, Ph.D.; E.A. Widder, Ph.D.; C.M. Young, Ph.D.

Bachelor of Science Degree Program

The biological sciences examine every aspect of living organisms, from the biochemical reactions involved in supporting cellular processes to the interaction of organisms with their environment. The Bachelor of Science in Biological Sciences seeks to educate students in unifying themes in biology, while encouraging them to expand their knowledge in more specialized subject areas. The department offers six undergraduate program options in which a student may specialize: aquaculture, ecology, general biology, marine biology, molecular biology and preprofessional biology. The curriculum is organized so that in the first two years students learn concepts fundamental to all biological sciences, and in the last two years students follow their own interests in selecting courses that are more specialized.

The **aquaculture** option studies the theory and practice of finfish and shellfish culture. Following a core curriculum of basic science and mathematics, students take specialized courses in culture techniques of salt and freshwater algae, crustaceans, finfish and molluscs.

The **ecology** option provides a well-rounded background in applied and theoretical ecology. Emphasis is placed on student-led experimental design and implementation, with ample opportunity for fieldwork. Ecology majors are required to take part in summer field courses, choosing between programs in Africa, Australia, the Bahamas, Costa Rica, Peru, or the United States. Graduates are fully prepared for ecology-related employment or graduate studies in ecology.

The **general biology** option offers the greatest flexibility to satisfy a student's specific interests.

The **marine biology** option includes specialized courses in marine biology and oceanography to provide the knowledge and skills for the study of marine life. Emphasis is on the diversity of marine organisms, their characteristics, interrelationships and interactions with the marine environment. The program prepares students for employment or graduate work on subjects from marine microbes to mammals, and from marine biology to ecology.

The **molecular biology** option provides training in DNA and protein purification, recombinant DNA technology, gene manipulation, PCR, nucleic acid hybridization, DNA sequence analysis, gene expression assays and genomics. Students completing the program are qualified for employment in the rapidly growing biotechnology industry and for entry into graduate study in a wide variety of areas encompassed by molecular biology.

The **preprofessional biology** option is designed to aid students who are interested in pursuing a graduate degree in one of the health professions, such as medicine (allopathic, osteopathic, podiatric, dental or veterinary) or in an allied health profession (physician's assistant, physical therapy, occupational therapy, optometry or pharmacy). The courses in the option fulfill most of the admission requirements for health professional schools; however, individual professional schools may have specific requirements that are not included in the core curriculum. The chair of the preprofessional biology option serves as Florida Tech's chief health professions adviser, and provides students with admission materials and guidance on admission procedures for the various professional schools. The option chair also organizes a premedical evaluation committee to provide professional schools with letters evaluating students' potential for further study.

Undergraduate Research

Research is an integral part of the study of biological sciences, and students are encouraged to participate in ongoing research directed by departmental faculty. Each option allows research courses to fulfill up to nine hours of restricted or free elective credit.

Summer Field Biology Courses

Between the freshman-sophomore, sophomore-junior, and junior-senior years, students can elect to participate in the summer field biology and ecology program. Field biology courses serve as required courses in the ecology option and can serve as restricted electives for various programs. Students wishing to participate are encouraged to consult with their advisers early during the academic year to reserve places in the classes. Courses in the summer field program are taught in Africa, Australia, the Bahamas, Costa Rica and Peru; and in the United States, in the Appalachian Mountains, Rocky Mountains, and the southwestern deserts.

Admission Requirements

Students intending to apply for admission to study in the department of biological sciences should elect at least one year each of high school biology, chemistry and physics. Prospective students should also have at least three years of high school mathematics, including second-year algebra and trigonometry.

Florida Tech has articulation agreements with many of the community colleges in Florida. Students contemplating transfer to Florida Tech should consult with the department to determine transferability of credits. If there is a question regarding specific courses needed, students should contact the associate department head for undergraduate studies.

Degree Requirements

Candidates for a Bachelor of Science in Biological Sciences must complete the minimum course requirements outlined in the following curriculum. Electives are selected in consultation with the faculty adviser to reflect the knowledge a student needs either for employment or graduate school.

Freshman Year (All Options)

FALL	CREDITS
BIO 1010 Biological Discovery 1	4
CHM 1101 General Chemistry 1	4
COM 1101 Composition and Rhetoric	3
MTH 1001 Calculus 1	4
	15

SPRING	
BIO 1020 Biological Discovery 2	4
BIO 1200 Introduction to Health Professions*	1
BIO 1500 Introduction to Aquaculture**	1
CHM 1102 General Chemistry 2	4
COM 1102 Writing about Literature	3
MTH 1002 Calculus 2	4
	15–16

**Required in Preprofessional option only.*

***Required in Aquaculture option only.*

Sophomore Year (Aquaculture, Ecology, General and Marine Biology Options)

FALL	CREDITS
BIO 2110 General Genetics	4
CHM 2001 Organic Chemistry 1	3
CHM 2011 Organic Chemistry Lab 1	2
HUM 2051 Civilization 1	3
PHY 1001 Physics 1	4
	16

SPRING	
BIO 2801 Biometry	3
CHM 2002 Organic Chemistry 2	3
CHM 2012 Organic Chemistry Lab 2	2
HUM 2052 Civilization 2	3
PHY 2002 Physics 2	4
	16

Sophomore Year (Molecular and Preprofessional Options)

FALL	CREDITS
BIO 2110 General Genetics	4
CHM 2001 Organic Chemistry 1	3
CHM 2011 Organic Chemistry Lab 1	2
HUM 2051 Civilization 1	3
PHY 1001 Physics 1	4
PHY 2091 Physics Lab 1	1
	17

SPRING

BIO	2010	Microbiology 4
CHM	2002	Organic Chemistry 2 3
CHM	2012	Organic Chemistry Lab 2 2
HUM	2052	Civilization 2 3
PHY	2002	Physics 2 4
PHY	2092	Physics Lab 2 1
		17

Junior Year (Aquaculture Option)

FALL			CREDITS
BIO	3410	General Ecology	4
BIO	3510	Invertebrate Zoology	4
BIO	4010	Biochemistry 1	4
OCN	3201	Marine and Environmental Chemistry	3
OCN	3211	Marine and Environmental Chemistry Lab	1
			16

SPRING

BIO	2010	Microbiology 4
BIO	3625	Molluscan Aquaculture 3
COM	2223	Scientific and Technical Communication 3
		Humanities Elective 3
		Liberal Arts Elective 3
		16

Junior Year (Ecology Option)

FALL			CREDITS
BIO	3410	General Ecology	4
BIO	3510	Invertebrate Zoology	4
BIO	3701	Evolution	3
COM	2223	Scientific and Technical Communication	3
			14

SPRING

BIO	4410	Community Ecology 4
		Humanities Elective 3
		Restricted Elective 4
		Technical Elective 3
		14

SUMMER

BIO	xxxx	Field Biology Courses 6
		6

Junior Year (General Option)

FALL			CREDITS
BIO	3410	General Ecology	4
BIO	3510	Invertebrate Zoology	4
BIO	4010	Biochemistry 1	4
		Humanities Elective	3
			15

SPRING

BIO	2010	Microbiology 4
BIO	3220	Developmental Biology 4
COM	2223	Scientific and Technical Communication 3
		Liberal Arts Elective 3
		Technical Elective 3
		17

Junior Year (Marine Option)

FALL			CREDITS
BIO	3410	General Ecology	4
BIO	3510	Invertebrate Zoology	4
BIO	4010	Biochemistry 1	4
		Social Science Elective	3
			15

SPRING

BIO	2010	Microbiology 4
BIO	4410	Community Ecology 4
COM	2223	Scientific and Technical Communication 3
		Humanities Elective 3
		Technical Elective 3
		17

Junior Year (Molecular Option)

FALL			CREDITS
BIO	3210	Mammalian Physiology	4
BIO	4010	Biochemistry 1	4
COM	2223	Scientific and Technical Communication	3
		Humanities Elective	3
			14

SPRING

BIO	2801	Biometry 4
BIO	4101	Molecular Biology 3
BIO	4110	Biochemistry 2 4
BIO	4210	Plant Physiology 4
		15

Junior Year (Preprofessional Option)

FALL			CREDITS
BIO	3210	Mammalian Physiology	4
BIO	4010	Biochemistry 1	4
COM	2223	Scientific and Technical Communication	3
		Technical Elective	3
			14

SPRING

BIO	3220	Developmental Biology 4
BIO	3801	Biometry 4
		Humanities Elective 3
		Restricted Elective (BIO) 4
		15

Senior Year (Aquaculture Option)

FALL			CREDITS
BIO	4530	Biology of Fishes	4
BIO	4625	Crustacean Aquaculture	3
		Restricted Elective (BIO, CHM, ENS, OCN)	4
		Social Science Elective	3
		Technical Elective	3
			17

SPRING

BIO	4620	Fish Aquaculture and Management 4
		Liberal Arts Elective 3
		Restricted Elective (BIO, CHM, ENS, OCN) 6
		Free Elective 3
		16

Senior Year (Ecology Option)

FALL			CREDITS
BIO	3210	Mammalian Physiology	4
BIO	4010	Biochemistry 1	4
ENS	4800	Limnology	3
		Restricted Elective (BIO, CHM, ENS, OCN)	3
		Social Science Elective	3
			17

SPRING

BIO	4210	Plant Physiology 4
		Liberal Arts Elective 3
		Restricted Elective (BIO, CHM, ENS, OCN) 4
		Free Elective 3
		14

Senior Year (General Option)

FALL			CREDITS
BIO	3210	Mammalian Physiology	4
BIO	3701	Evolution	3
BIO	4550	Comparative Vertebrate Anatomy	4
		Restricted Elective (BIO, CHM, ENS, OCN)	3
		Social Science Elective	3
			17

SPRING

BIO	4210	Plant Physiology 4
		Liberal Arts Elective 3
		Restricted Elective (BIO, CHM, ENS, OCN) 7
		Free Elective 3
		17

Senior Year (Marine Option)

FALL	CREDITS
BIO 3701 Evolution	3
BIO 4550 Comparative Vertebrate Anatomy	4
BIO 4710 Marine Biology	4
Liberal Arts Elective	3
Restricted Elective (BIO, CHM, ENS, OCN)	3
	17

SPRING	
BIO 4720 Marine Ecology	4
Liberal Arts Elective	3
Restricted Elective (BIO, CHM, ENS, OCN)	7
Free Elective	3
	17

Senior Year (Molecular Option)

FALL	CREDITS
BIO 4120 Genetic Engineering Techniques	4
Liberal Arts Elective	3
Restricted Elective (BIO, CHM, ENS, OCN)	7
Social Science Elective	3
	17

SPRING	
BIO 4130 Nucleic Acid Analysis	4
Liberal Arts Elective	3
Restricted Elective (BIO, CHM, ENS, OCN)	4
Technical Elective	3
Free Elective	3
	17

Senior Year (Preprofessional Option)

FALL	CREDITS
BIO 4550 Comparative Vertebrate Anatomy	4
Liberal Arts Elective	3
Restricted Elective (BIO, CHM, ENS, OCN)	7
Social Science Elective	3
	17

SPRING	
BIO 4201 Immunology	3
Liberal Arts Elective	3
Restricted Elective (BIO, CHM, ENS, OCN)	8
Free Elective	3
	17

TOTAL CREDITS REQUIRED BY OPTION

Aquaculture	128
Ecology	127
General Biology	128
Marine Biology	128
Molecular Biology	127
Preprofessional	128

Master of Science Degree Programs

Biology

The master of science degree in biology can be earned in one of three options: ecology, marine biology or cell and molecular biology. The purpose of each option is to prepare the student for either a professional career or for further graduate study. This goal is achieved through a balance of course work and research activities.

Admission Requirements

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog. For this program, Graduate Record Examination scores (General Test only), three letters of recommendation and a statement of objectives are required. Admission decisions for fall semester enrollment are made by March 15, and for spring semester enrollment admission decisions are made by October 1.

Degree Requirements

The master of science degree requires the successful completion of 34 credit hours, including formal course work, presentation of a graduate thesis seminar and preparation and oral defense of a thesis. The thesis involves the completion of original research of publishable quality.

The student's thesis research and program of study reflect the emphasis of the option. All thesis research is conducted under the direction of an adviser and an advisory committee. The advisory committee is composed of at least three members: two from the department (including the adviser) and one from another academic unit.

Curriculum

The adviser assists the student in devising a program of study. The latter requires approval by the program of study committee and the department head. The student must complete courses appropriate for the option. These can be chosen from the offerings of any academic unit in the College of Science and Liberal Arts, College of Engineering and School of Psychology. Students wanting to acquire special research skills should enroll in Biological Research Rotation (BIO 5998). A master's student must elect the Biological Sciences Seminar (BIO 5990) every semester it is offered, except for the semester in which the student presents a thesis seminar. During this semester, the student will register for both Thesis (BIO 5999) and Biological Research Seminar (BIO 5991). Each student must present a departmental thesis seminar prior to graduation.

SUMMARY OF PROGRAM REQUIREMENTS

Formal Course Work (minimum)	18
Biological Research Seminar	1
Biological Research or Biological Research Rotation	0–9
Thesis (maximum)	6
TOTAL CREDITS REQUIRED	34

Biotechnology

The marine environment is a rich source of pharmaceuticals, polymers, diagnostic reagents and genetically diverse organisms. The biological processes of the majority of marine organisms are not well understood and the biotechnology industry lacks individuals trained to develop and practice biotechnology using marine animals, plants and microorganisms. The master's program in biotechnology is a nonthesis program that builds on Florida Tech's unique location on the Atlantic coast, and its established strengths in marine biology, marine ecology, natural products chemistry, molecular biology and biochemistry to provide a path for students who aspire to learn biotechnology and earn jobs in industry. The program is focused on those areas of biotechnology related to microbiology, natural products chemistry and molecular biology of marine organisms. Students are provided with a diverse combination of classroom experience, field studies, chemical and molecular biological laboratory techniques and development of communication skills most appropriate for an industrial or academic research career.

Summer Internships

The goal of this training program is to produce individuals with a strong interdisciplinary background in biology and chemistry, who will be qualified to meet the needs of biotechnology in industrial or academic settings. To provide additional experience with state-of-the-art technology,

students in this program have the opportunity to include summer internships in an industrial laboratory as part of their degree training. In most cases, these internships are related to a collaboration between Florida Tech faculty and a particular laboratory in a biotechnology firm. Internship sites include Merck, Sharp and Dohme (Rahway, N.J.), Lederle Labs (Pearl River, N.Y.) and Zymogenetics (Seattle, Wash.). Those students wishing to receive internship training locally may substitute a research experience with Florida Tech faculty, subject to approval.

Admission Requirements

The applicant must have a bachelor of science degree in biology, chemistry, biochemistry or equivalent. Applicants deficient in organic chemistry, genetics, biochemistry or microbiology are required to take undergraduate courses prior to starting the master of science program. Admission decisions for fall semester enrollment are made by March 15, and for spring semester enrollment admission decisions are made by October 1.

Degree Requirements

The Master's Degree in Biotechnology is a nonthesis option and requires the satisfactory completion of 33 credit hours, including 21 credit hours of required core courses, six credit hours of elective courses, seminars (BIO 5990) and six credit hours of summer laboratory experience at Florida Tech (BIO 5537) or an industrial internship (BIO 5997). A project report on the research experience is written, presented and defended before a committee. The composition of the committee will be similar to the master's degree committee. The committee may ask questions relating to previous course work.

Curriculum Core Courses

BIO 5501 Cellular and Molecular Biology
BIO 5515 Pharmacology and Drug Design
BIO 5535 Current Topics in Biotechnology
BIO 5539 Microbial Biotechnology
BIO 5546 Growth and Division of Cells 2: Eukaryotes
BIO 5575 Biology of Cancer
CHM 5507 Natural Products

Electives

At least six credit hours of elective courses are required and a choice from the following courses is suggested. In addition to this list, courses from oceanography, chemistry or engineering may be chosen with approval of the Graduate Studies Committee.

BIO 5030 Conservation Biology
BIO 5080 Mechanisms of Biological Clocks
BIO 5502 Molecular Biology of Signal Transduction
BIO 5520 Regulation of Animal and Plant Development
BIO 5540 Biochemical Toxicology
BIO 5545 Growth and Division of Cells: Prokaryotes
BIO 5635 Introductory Neurobiology
BIO 5725 Pathogenic Bacteriology
BIO 5815 Molecular Studies of Marine Biodiversity

SUMMARY OF PROGRAM REQUIREMENTS

Required Course Core	21
Elective Courses	6
Internship or Summer Lab Experience	6
	33

Doctor of Philosophy Degree Program

The doctor of philosophy degree is offered for students who want to carry out advanced research in the biological sciences. A student's research can encompass any area represented by a faculty member. The objective is to prepare the student at the highest academic level for a productive career in research, teaching and/or administration.

Admission Requirements

A doctoral applicant must have a bachelor's or master's degree. For admission, a student should have a superior academic record, with a minimum of 3.0 (on a scale of 4.0) in undergraduate work or 3.2 in graduate work, three letters of recommendation and scores from the Graduate Record Examination. For the latter, both the General Test and the Subject Test in biology are required.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog. Admission decisions for fall semester enrollment are made by March 1, and for spring semester enrollment admission decisions are made by October 1.

Degree Requirements

The doctor of philosophy degree is primarily a research degree and is conferred in recognition of research accomplishments as well as completion of a program of study. Each student must complete an approved program of study, pass a comprehensive written and/or oral examination, write an acceptable research proposal and file a petition for admission to candidacy, complete a program of significant original research, prepare and defend a dissertation concerning the research and present a dissertation seminar. Each candidate is expected to publish major portions of the dissertation in refereed national or international journals.

Each doctoral student must prepare a program of study within one year after entering the program. To assure that the student possesses a satisfactory knowledge of biological principles, the student might be required to take certain courses in biological sciences and related disciplines. The student has an advisory committee appointed by his or her adviser with the approval of the department head. The committee is composed of at least five members: four faculty members (including the adviser) from the department and one faculty member from another academic unit.

The proposal represents the research plan that the student will pursue for the dissertation. It should be written under the close supervision of the adviser, and the proposal must be presented to and approved by the advisory committee.

Doctoral research represents a significant contribution to the knowledge of a particular problem. A student must be prepared to devote considerable time and effort to research. With the adviser's approval, the student presents the preliminary copies of the dissertation to the advisory committee for critical evaluation. Once the dissertation satisfies the advisory committee, the student then orally defends the work. If the defense is satisfactory, the advisory committee will approve the dissertation once the final revisions are completed.

Prior to graduation, the student must present a dissertation seminar to the faculty and graduate students.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

The adviser assists the student in devising a program of study, which requires approval by the program of study committee and the department head. The committee and department head must also approve any revision of the program of study.

In developing a program of study, considerable latitude is allowed for course selection and research interests. Appropriate courses can be selected from the offerings of any academic unit in the College of Science and Liberal Arts, College of Engineering or School of Psychology. The student may register for Biological Research Rotation (BIO 5998) to learn specific skills and techniques available from the faculty. All doctoral students must elect the Biological Sciences Seminar (BIO 5990) every semester it is offered, except for the semester the student presents a dissertation seminar (Biological Research Seminar, BIO 5991).

SUMMARY OF PROGRAM REQUIREMENTS

Formal Course Work Beyond Bachelor's Degree (minimum)	24
Biological Research Seminar	1
Biological Research*	0–24
Doctoral Dissertation (maximum)	30

**Inclusion of Biological Research Rotation (BIO 5998) is recommended.*

A minimum of 79 credits beyond the bachelor's degree is required.

For students entering with a master's degree, former course work completed for the master's degree can fulfill a significant portion of the 24 credit hours of required doctoral course work. Nonetheless, the student should be prepared to complete some additional course work.

Research Activities and Facilities

The department faculty are conducting research in the following general areas:

Biochemistry, Molecular Biology and Molecular Genetics

A variety of molecular and biochemical approaches are used in the department to answer questions related to regulation of cell duplication, signal transduction in early development, circadian rhythms and sensory systems, microbial pathogenesis, plant growth, and the assembly of subcellular structures. A major effort is underway to develop novel cell culture systems for production of synchronously growing populations of human cells. Intracellular complexes of DNA and protein are under study to elucidate the regulatory mechanisms that trigger DNA replication and cell division in bacteria. The role of signal transduction pathways induced by calcium in the fertilization step of embryogenesis is another active area of research. Drug discovery efforts are focused on the genetics of the polyketide synthesis pathway in a variety of uncharacterized microorganisms collected from extreme environments. Development and analysis of new bacterial growth inhibitors is also underway for *Mycobacterium*, *Escherichia* and other important bacterial pathogens. Another expanding research area is the neurophysiological and molecular analysis of photoreceptors, particularly the infrared receptors in snakes. The diversity of biochemical and molecular research conducted by members of the biological sciences department provides for a rich and interactive environment for graduate students.

Marine Biology

The marine biology faculty maintain active research programs in finfish, crustacean, molluscan, coral and echinoderm biology. The evolution and ecological physiology of organismal design are investigated using high-speed videography, electromyography, and biomechanical and ecomorphological analysis of feeding in field-caught and laboratory-reared fish. Fisheries research includes analyses of early-life history and recruitment patterns of estuarine-dependent sport fish species. Research on crustaceans centers on the ecology and physiology of adult and early-life history stages, especially the migratory behavior of spawning female crabs and the recruitment and habitat selection of post larvae. Research on suspension-feeding invertebrates examines the mechanisms responsible for food capture, selection and processing. Remote sensing, as well as laboratory and field investigations of corals, explores the effects of global-climate change on coral reefs. Studies of echinoderms have concentrated on their reproduction, anatomy, systematics and ecology by using physiological, histological, morphological and field techniques. Aquaculture programs are investigating the reproductive and feeding biology of ornamental shellfish and finfish species.

Molecular Marine Biology

Collaborative research among diverse faculty and students enables the application of molecular biological techniques to marine biology topics such as genetic identification of fishery and manatee populations, biochemistry of molluscan shell growth, response of marine organisms to anthropogenic pollutants, genetic engineering in aquaculture and the relationship of enzymes to rates of calcification and skeletogenesis in commercially significant marine organisms.

Plant Physiology and Plant Tissue Culture

Studies are conducted on the initiation of *in vitro* plant cultures of various plant species, and on the changes that accompany *in vitro* differentiation. Research on the identity of genes that are specific to particular stages of differentiation, and attempts to propagate rare species with tissue culture techniques, are in progress.

Ecology and Conservation Biology

Research activities include studies of coral reef ecology, paleobotany, biogeography, biodiversity, freshwater and marine aquaculture, fisheries ecology, population ecology of marine mammals, ecomorphology and the life history and ecology of selected crustaceans and echinoderm species. Study locations range from local to international, including the Indian River Lagoon, sites along the Atlantic seaboard and offshore from New Jersey to Florida, the Bahamas and Amazonia.

Chemistry

Bachelor of Science *Master of Science* *Doctor of Philosophy*

Options in:
Chemical Management
General Chemistry
Premedical Chemistry
Research Chemistry

Professors

Michael W. Babich, Ph.D., *solid-state chemistry, including X-ray crystallographic structure determination, mechanisms of reactions in solids, kinetic investigations of coordination complexes, thermal analysis.*

Gordon L. Nelson, Ph.D., *polymers, polymer flammability and aging, C-13 NMR.*

Joshua Rokach, Ph.D., *leukotrienes, lipoxins, synthetic organic chemistry, synthetic pharmaceuticals.*

Mary L. Sohn, Ph.D., *nature of sedimentary humic acids in aquatic sediments, evaluation of humic acid-metal and humic acid-organometallic formation constants.*

Associate Professors

J. Clayton Baum, Ph.D., *molecular spectroscopy, including photophysical and photochemical problems, and energy transfer and relaxation processes; molecular orbital calculations.*

Alan B. Brown, Ph.D., *physical organic chemistry, stereochemistry, bio-organic chemistry.*

Virender K. Sharma, Ph.D., *analytical, geochemistry and environmental chemistry.*

Assistant Professors

Monica Baloga, Ph.D., *bio-organic chemistry, physical organic chemistry.*

Nasri A. Nesnas, Ph.D., *bio-organic chemistry.*

Mark J. Novak, Ph.D., *enzyme-assisted synthesis, biocatalysis.*

Bachelor of Science Degree Program

The Department of Chemistry offers a bachelor of science degree program in chemistry that is accredited by the American Chemical Society. This program prepares the graduate for the many diverse career opportunities available to the chemist in government, private industry and academia. There are four program options:

Research chemistry option—Students receive an ACS-certified degree by following this option. Research chemistry is the best choice for those who wish to pursue an advanced degree after graduation and are interested in a career in chemical research. This option features a full year of undergraduate research during the senior year.

General chemistry option—This option is similar to the research chemistry option but without senior research, thus allowing greater flexibility for the addition of electives during the senior year. It also provides excellent preparation for professional or graduate schools, or for a career in industry.

Chemical management option—This option is designed for the student interested in a business career in the chemical industry. Chemical management provides a complete program in chemistry, supplemented with selected business course work.

Premedical chemistry option—This option is designed for the student interested in a solid background in chemistry in preparation for a career in medicine or a related professional field. The curriculum includes all required course work to make the student competitive for admission to medical, dental or veterinary schools. The adviser to this program provides up-to-date information on admission requirements for most of those schools, as well as admission test information.

A dual-degree option is available for students with interest in both chemistry and chemical engineering. This option requires approximately one additional year of study and allows the student to complete bachelor's degrees in both chemistry and chemical engineering.

In addition, a bachelor's degree program in biochemistry is cosponsored with the biological sciences department. For more information on this program, see "Biochemistry" in this catalog.

Degree Requirements

Candidates for a Bachelor of Science in Chemistry must complete the minimum course requirements as indicated for each option. Deviation from the recommended program can be made only with the approval of the student's adviser and the concurrence of the department head.

Because the subject matter in general chemistry forms a critically important foundation for all of the advanced chemistry courses, both CHM 1101 and CHM 1102 must be passed with grades of at least C before taking any other chemistry courses.

All Options Except Premedical

Freshman Year

FALL	CREDITS
BUS 1301 Basic Economics	3
CHM 1101 General Chemistry 1*	4
COM 1101 Composition and Rhetoric	3
CSE 1503 Introduction to Software Development/FORTRAN	3
MTH 1001 Calculus 1	4
	17

SPRING	
CHM 1102 General Chemistry 2	4
COM 1102 Writing about Literature	3
MTH 1002 Calculus 2	4
PHY 1001 Physics 1	4
PHY 2091 Physics 1 Lab	1
	16

**Credit can be obtained based on College Board Advanced Placement examinations taken prior to enrollment at Florida Tech. Students interested in receiving advanced-placement credit for chemistry should take the College Board Advanced Chemistry examination and request that the results be sent to Florida Tech.*

Sophomore Year

FALL	CREDITS
CHM 2001 Organic Chemistry 1	3
CHM 2011 Organic Chemistry Lab 1	2
HUM 2051 Civilization I	3
MTH 2001 Calculus 3	4
PHY 2002 Physics 2	4
PHY 2092 Physics Lab 2	1
	17

SPRING	
CHM 2002 Organic Chemistry 2	3
CHM 2012 Organic Chemistry Lab 2	2
HUM 2052 Civilization 2	3
MTH 2201 Differential Equations/Linear Algebra	4
Technical Elective	3
	15

General Chemistry and Research Chemistry Options

Junior Year

FALL	CREDITS
CHM 3001 Physical Chemistry 1	3
CHM 3011 Physical Chemistry Lab 1	2
CHM 3301 Analytical Chemistry 1	3
CHM 3311 Analytical Chemistry Lab 1	2
Social Science Elective	3
Technical Elective	3
	16

SPRING	
CHM 3002 Physical Chemistry 2	3
CHM 3012 Physical Chemistry Lab 2	2
CHM 3302 Analytical Chemistry 2/Instrumentation	3
CHM 3312 Analytical Chemistry 2/Instrumentation Lab	2
COM 2012 Research Sources and Systems	1
Humanities Elective	3
Free Elective	3
	17

General Chemistry Option

Senior Year

FALL	CREDITS
CHM 4001 Inorganic Chemistry 1	3
CHM 4900 Chemistry Seminar	0
Humanities Elective	3
Restricted Elective* (Chemistry)	3
Technical Electives	6
	15

SPRING	
CHM 4611 Advanced Lab Techniques	2
CHM 4900 Chemistry Seminar	0
COM 2223 Scientific and Technical Communication	3
Technical Elective	3
Restricted Electives* (Chemistry)	6
	14

TOTAL CREDITS REQUIRED 127

The technical electives are selected in consultation with the student's adviser. The undergraduate research sequence, CHM 4800 and CHM 4801, may be taken with departmental approval.

Research Chemistry Option**

Senior Year

FALL	CREDITS
BIO 4010 Biochemistry 1	4
CHM 4001 Inorganic Chemistry 1	3
CHM 4900 Chemistry Seminar	0
CHM 4910 Senior Thesis in Chemistry	3
COM 2223 Scientific and Technical Communication	3
Restricted Elective* (Chemistry)	3
	16

SPRING	
CHM 4002 Advanced Inorganic Chemistry	3
CHM 4611 Advanced Lab Techniques	2
CHM 4901 Senior Research Seminar	1
CHM 4911 Senior Thesis in Chemistry	3
Restricted Electives* (Chemistry)	6
	15

TOTAL CREDITS REQUIRED 129

Chemical Management Option

Junior Year

FALL	CREDITS
BUS 1701 Introduction to Business	3
CHM 3001 Physical Chemistry 1	3
CHM 3011 Physical Chemistry Lab 1	2
CHM 3301 Analytical Chemistry 1	3
CHM 3311 Analytical Chemistry Lab 1	2
MTH 2401 Probability and Statistics	3
	16

SPRING	
BUS 2201 Accounting Principles 1	3
CHM 3002 Physical Chemistry 2	3
CHM 3012 Physical Chemistry Lab 2	2
CHM 3302 Analytical Chemistry 2	3
CHM 3312 Analytical Chemistry Lab 2	2
Social Science Elective	3
	16

Senior Year

FALL	CREDITS
BUS 3401 Corporate Finance 1	3
CHM 4001 Inorganic Chemistry 1	3
CHM 4900 Chemistry Seminar	0
COM 2012 Research Sources and Systems	1
Humanities Elective	3
Restricted Elective* (Chemistry)	3
Free Elective	3
	16

SPRING	
BUS 3501 Management Principles	3
BUS 3601 Marketing Principles	3
CHM 4900 Chemistry Seminar	0
COM 2223 Scientific and Technical Communication	3
Humanities Elective	3
Restricted Elective* (Chemistry)	3
	15

TOTAL CREDITS REQUIRED 128

**Selected from the following list:*

CHM 4002 Advanced Inorganic Chemistry	*3*
CHM 4111 Advanced Physical Chemistry	*3*
CHM 4304 Advanced Analytical Chemistry	*3*
CHM 4500 Advanced Organic Chemistry	*3*
CHM 4550 Polymer Chemistry	*3*

***To enter the senior year of the research chemistry option, a cumulative grade point average of 3.0 in all chemistry courses at the end of the fall semester of the junior year is required.*

Premedical Chemistry Option

Freshman Year

FALL	CREDITS
BIO 1010 Biological Discovery 1	4
CHM 1101 General Chemistry 1	4
COM 1101 Composition and Rhetoric	3
MTH 1001 Calculus 1	4
	15

SPRING	
BIO 1020 Biological Discovery 2	4
BIO 1200 Introduction to the Health Professions	1
CHM 1102 General Chemistry 2	4
COM 1102 Writing about Literature	3
MTH 1002 Calculus 2	4
	16

Sophomore Year

FALL	CREDITS
CHM 2001 Organic Chemistry 1	3
CHM 2011 Organic Chemistry Lab 1	2
HUM 2051 Civilization 1	3
MTH 2001 Calculus 3	4
PHY 1001 Physics 1	4
PHY 2091 Physics Lab 1	1
	17

SPRING	
CHM 2002 Organic Chemistry 2	3
CHM 2012 Organic Chemistry Lab 2	2
HUM 2052 Civilization 2	3
MTH 2201 Differential Equations/Linear Algebra	4
PHY 2002 Physics 2	4
PHY 2092 Physics Lab 2	1
	17

Junior Year

FALL	CREDITS
BIO 2110 General Genetics	4
BIO 3210 Mammalian Physiology	4
or	
BIO 4010 Biochemistry 1	4
CHM 3001 Physical Chemistry 1	3
CHM 3301 Analytical Chemistry 1	3
CHM 3311 Analytical Chemistry Lab 1	2
	16

SPRING	
CHM 3002 Physical Chemistry 2	3
CHM 3302 Analytical Chemistry 2	3
CHM 3312 Analytical Chemistry Lab 2	2
COM 2012 Research Sources and Systems	1
COM 2223 Scientific and Tech Communication	3
CSE 1503 Introduction to Software Development/FORTRAN	3
	15

Senior Year

FALL	CREDITS
CHM 3011 Physical Chemistry Lab 1	2
CHM 4001 Inorganic Chemistry 1	3
CHM 4900 Chemistry Seminar	0
Liberal Arts Elective	3
Restricted Elective (Chemistry)	3
Technical Elective	3
Social Science Elective	3
	17

SPRING	
CHM 3012 Physical Chemistry Lab 2	2
CHM 4900 Chemistry Seminar	0
Humanities Elective	3
Liberal Arts Elective	3
Restricted Electives (Chemistry)	6
Free Elective	3
	17

TOTAL CREDITS REQUIRED 130

Master of Science Degree Program

Admission Requirements

An applicant for admission to the master's program should have an undergraduate degree in chemistry or in a related area. Typically, a minimum of eight semester courses should have been taken in four of the five major fields of chemistry: organic, analytical, physical, inorganic and biochemistry; as well as appropriate courses in mathematics and physics. Applicants may be admitted on a provisional basis with the requirement that undergraduate deficiencies be corrected during the first year of study. Proficiency examinations are administered to all new students the week prior to the beginning of classes as an aid in planning each program of study.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The Master of Science in Chemistry is based on successful completion of a minimum of 34 graduate credits following an approved program plan. A research proposal, thesis and oral examination in defense of the thesis are required.

Thesis Research

A thesis, based on research conducted in residence at Florida Tech under the direction of a member of the chemistry department graduate faculty, is required. During the first academic semester, the student selects a faculty member to serve as research adviser. During the same semester and with the assistance of the adviser, the student selects an advisory committee, prepares a program plan, and defines a research topic. The student then progressively continues through the stages of research proposal, research, thesis and oral examination. Throughout this period, the advisory committee provides assistance and direction to the student and serves as the review board for the research proposal, thesis and oral examination.

Curriculum

Each student follows an individual program plan. The program plan must have a minimum of 34 credits and include four core chemistry courses, three additional chemistry courses, one technical elective, nine credits of thesis and one credit of seminar. The student must register for Graduate Seminar (CHM 5900) each semester offered, concluding with Thesis Seminar (CHM 5901) during the last semester of thesis research. All courses selected for inclusion on the program plan are subject to approval by the department head.

Core Courses

CHM 5002 Advanced Inorganic Chemistry
CHM 5111 Advanced Physical Chemistry
CHM 5304 Advanced Analytical Chemistry
CHM 5500 Advanced Organic Chemistry

Chemistry Electives

Three courses, chosen from different areas of specialization, must be taken from the following list:
CHM 5017 Physical Methods in Inorganic Chemistry
CHM 5018 Special Topics in Inorganic Chemistry
CHM 5095 Chemical Research Projects
CHM 5112 Special Topics in Physical Chemistry
CHM 5114 Applied Optical Spectroscopy
CHM 5119 Chemical Dynamics
CHM 5501 Interpretation of Chemical Spectra
CHM 5503 Organic Synthesis
CHM 5504 Theoretical Organic Chemistry
CHM 5507 Natural Products
CHM 5550 Polymer Chemistry

Technical Elective

The technical elective may be selected from other courses offered within the chemistry department or other departments of the university.

Doctor of Philosophy Degree Program

Admission Requirements

A candidate for the doctoral program will typically have a bachelor's or master's degree in chemistry with outstanding performance. Students enrolled in the master's program can

apply to change their status to work directly toward the doctorate after completing 14 credits of graduate course work at Florida Tech with a cumulative grade point average of at least 3.3.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The doctoral degree is primarily a research degree and is conferred in part in recognition of research accomplishments. Each student must pass the cumulative written examinations, complete an approved program of course work, demonstrate proficiency in a foreign language and/or computer languages, pass the comprehensive oral examination, write an acceptable research proposal and file a petition for admission to candidacy, complete a significant original research study, prepare and defend a dissertation concerning the research, and present a seminar on the dissertation research. The dissertation research is expected to be of publishable quality, according to the standards of peer-reviewed national or international journals.

Each new doctoral student is required to pass six cumulative examinations. At least four must be in the chosen area of concentration and up to two can be in an additional area. Students must begin these examinations in their second semester in residence. Four examinations are offered each semester. A maximum of 11 attempts is allowed.

A doctoral student must have a program of study approved by the doctoral committee and the department head by the end of the second semester in residence. This program is based on the student's goals and background.

Prior to admission to candidacy, the doctoral student must demonstrate a reading proficiency of the scientific literature in a foreign language. German, Russian and French are the preferred languages. No other language will be approved unless necessary for access to important literature in the student's specific research area. With the approval of the adviser and academic unit head, appropriate computer languages may be substituted.

The proposal presents the research plan to be followed in the dissertation work. It is developed under close supervision of the adviser. Areas of specialization are included under research activities. The proposal is presented to and approved by the student's committee and department head.

After the research project is completed and approved by the adviser, the dissertation is submitted to the advisory committee for critical evaluation. The student then orally defends the dissertation.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

In developing a program of study for the doctoral degree, considerable latitude is allowed to accommodate research interests. The following guidelines apply to students entering with a bachelor's degree:

Approved Chemistry Courses (minimum)	24
Additional Course Work	9
Chemistry Research	0–18
Dissertation (maximum)	30
MINIMUM REQUIRED BEYOND BACHELOR'S DEGREE	81

For students entering with a master's degree, course work completed for the master's degree can fulfill a significant proportion of the 33 hours of required doctoral course work. The student should be prepared to complete some additional course work.

Research Activities

Research areas presently of interest to department faculty and available for master's research projects are the following:

- Aquatic Organic Chemistry
- Bio-organic Chemistry
- Complexation Chemistry
- Electroanalytical Chemistry
- Energy Transfer
- Environmental Chemistry
- Molecular Spectroscopy
- Natural Products
- Organometallic Chemistry
- Pharmaceutical Chemistry
- Physical Organic Chemistry
- Solar Energy Applications
- Solid-Phase Reaction Kinetics
- Stereochemistry
- Synthetic Organic Chemistry
- Thermal Methods of Analysis

Physical and synthetic organic, synthetic pharmaceutical, natural products and marine natural products are the areas of specialization offered for doctoral research at the present time. Doctoral research in any other area requires approval of the research adviser and department head prior to admission to the program. Additional areas of specialization will be developed.

Communication

DEPARTMENT OF HUMANITIES AND COMMUNICATION
N.I. Matar, Ph.D., Head

Bachelor of Science *Master of Science (See Technical and Professional Communication)*

Program Chair
Carol M.H. Shehadeh, M.A.

Associate Professors
Randall L. Alford, Ph.D., *general linguistics, language education, German, English as a second language.*

Judith B. Strother, Ph.D., *theoretical and applied business, scientific and technical communication, editing, applied linguistics and psycholinguistics.*

Jane T. Tolbert, Ph.D., *journalism, mass communication, scientific and technical communication.*

Assistant Professors
Sharon C. Irvin, M.A., *technical writing, simplified English, technical documentation.*

Lars R. Jones, Ph.D., *medieval and Renaissance European art, photojournalism, iconography.*

Carol M.H. Shehadeh, M.A., *Internet publishing, business/technical writing and editing, documentation, instructional technology.*

Adjunct Professors
C. Frongillo, Ph.D.; P. Krist, Ph.D.; W. Picard, Ph.D.

Instructors
P. Bernard, M.S.; M. Denius, M.F.A.; B. Leach, M.A.; M. Mullins, M.A.; M. Ruane, M.A.; D. Russell, M.S.; J. Stottler, M.A.; J. Teegen, M.A.; F Wallace, M.S.Ed.

Lecturers
A. Belyi, M.A.; J. Bowering, B.F.A.; J.O. Davis, B.F.A.; K.D. Nichols, A.S.

Bachelor of Science Degree Program

The major in communication prepares graduates to meet today's ever-growing demand for skilled communicators who have specialized backgrounds in business, science or technology. Course work emphasizing either business or science and engineering augments a strong foundation in theoretical communication, in visual communication, and in written and oral communication. Graduates of this program are able to plan, research, write, edit and design reports, proposals, articles, brochures and other kinds of communication for both print and electronic delivery. Additionally, students learn to create and deliver effective professional presentations.

Upon reaching the junior year, a student must choose an area of specialization and include 21 semester hours of concentrated course work. Graduates specializing in business and marketing communication typically find employment in public relations, marketing, publications research, advertising, copywriting, editing, training and development, public information or consumer relations. Graduates specializing in Scientific and Technical Communication are typically employed as technical or scientific writers and editors, documentation designers, technical publications specialists, instructional designers, Web page designers or proposal writers.

Degree Requirements

Candidates for the Bachelor of Science in Communication require a total of 120 hours for graduation. Upon reaching the junior year, candidates must choose an area of concentration (either Business and Marketing Communication, or Scientific and Technical Communication) and include 21 semester hours of specialized course work. A senior with a GPA over 3.25 may apply for a six-semester-hour communication internship that reflects the area of concentration. The composition of the 120 credit-hour program must correspond to the following distribution of required and elective courses.

BUS	2601	Legal and Social Environments of Business 3
BUS	3501	Management Principles 3
COM	1101	Composition and Rhetoric 3
COM	1102	Writing about Literature 3
COM	2223	Scientific and Technical Communication 3
		or
COM	2224	Business and Professional Writing 3
COM	2241	Journalism 3
COM	2370	Speech 3
COM	2425	Introduction to Communication 3
COM	2501	Introduction to Visual Communication 3
COM	2502	Layout and Design 3
COM	3070	Professional Communication for Executives 3
COM	3210	Editing 3
COM	3425	Mass Communication 3
COM	4026	Publishing and the Internet 3
COM	4430	Research Methods and Materials in Technical and Professional Communication 3
CSE	1301	Introduction to Computer Applications 3
HUM	2051	Civilization 1 3
HUM	2052	Civilization 2 3
LNG	xxxx	Foreign Language 12
MTH	1701	College Algebra 3
MTH	1702	Applied Calculus 3
		Humanities Electives 6
		Free Electives 12
		Physical or Life Sciences Electives 6
		Social Science 3
		Concentration (select one) 21

Concentration (Select one 21-credit specialization)

Business and Marketing Communication

BUS	3601	Marketing Principles 3
COM	3440	Public Relations 3
COM	4424	Advanced Business and Professional Communication 3
and 12 hours from the following:		
BUS	3xxx	..... up to 9
COM	3xxx	..... up to 6
COM	4090	Communication Internship (Upon qualification) 6

Scientific and Technical Communication

COM	3223	Advanced Technical Writing 3
COM	3231	Writing about Science 3
and 12 hours from the following:		
		Restricted Electives (Computer Science, Engineering or Science) ..... up to 9
COM	3xxx	..... up to 6
COM	4090	Communication Internship (Upon qualification) 6

Freshman Year

FALL		CREDITS
COM	1101	Composition and Rhetoric 3
CSE	1301	Introduction to Computer Applications 3
MTH	1701	College Algebra 3
		Restricted Elective (Physical or Life Science) 3
		Social Science Elective 3
		15

SPRING		
COM	1102	Writing about Literature 3
COM	2370	Speech 3
MTH	1702	Applied Calculus 3
		Restricted Elective (Physical or Life Science) 3
		Free Elective 3
		15

Sophomore Year

FALL		CREDITS
COM	2223	Scientific and Technical Communication 3
		or
COM	2224	Business and Professional Writing 3
COM	2425	Introduction to Communication 3
COM	2501	Introduction to Visual Communication 3
HUM	2051	Civilization 1 3
LNG	xxxx	Foreign Language 3
		15

SPRING		
BUS	2601	Legal and Social Environments of Business 3
COM	2241	Journalism* 3
COM	2502	Layout and Design 3
HUM	2052	Civilization 2 3
LNG	xxxx	Foreign Language 3
		15

Junior Year

FALL		CREDITS
COM	3210	Editing* 3
COM	3425	Mass Communication 3
LNG	xxxx	Foreign Language 3
		Concentration 6
		15

SPRING

BUS	3501	Management Principles 3
COM	3070	Professional Communication for Executives 3
COM	4026	Publishing and the Internet 3
LNG	xxxx	Foreign Language 3
		Concentration 3
		15

Senior Year

FALL		CREDITS
COM	4430	Research Methods and Materials in Technical and Professional Communication 3
HUM	xxxx	Humanities Elective 3
		Concentration 6
		Free Elective 3
		15

SPRING

HUM	xxxx	Humanities Elective 3
		Concentration 6
		Free Electives 6
		15

TOTAL CREDITS REQUIRED 120

** Not always offered in semester indicated.*

Master of Science Degree Program

(See Technical and Professional Communication.)

DEPARTMENT OF SCIENCE AND MATHEMATICS EDUCATION
R.H. Fronk, Ph.D., Head

Computer Education

Master of Science
Concentrations in:
Computer Science Certification
Instructional Technology

Professor
Robert H. Fronk, Ph.D., *computer and technology education, geology/biology education, experimental design.*

Associate Professors
Michael A. Gallo, Ph.D., *instructional technology, statistics, research design.*

J. Richard Newman, Ph.D., *computer graphics, information resource management.*

Assistant Professors
Bradford Allen, Ed.D., *computer simulation, statistical research methodology, testing and evaluation, modeling.*

Richard E. Enstice, Ph.D., *administration in higher education, computers in education, computer networking.*

Master of Science Degree Program

The master's degree in computer education is designed for all teachers who want to further their education in the use of educational technology and microcomputers in school. It is appropriate for teachers at any grade level and for any subject matter area. The curricula are designed for students with minimal background in computers.

Two degree options are offered. The first is for students wishing to teach computer science in high school (requires certification in computer science). The second is Instructional Technology and is for students interested in teaching with technology and computers, and teaching computer applications and computer literacy (does not require certification in computer science).

The master's degree in computer education can be earned either on a full-time or part-time basis. All courses are available in the late afternoon or evening. Full-time students can normally complete the degree in a minimum of three semesters. Students can select either a thesis or nonthesis option.

The goal of the program (depending on the option) is to enable a teacher to teach introductory computer science, computer literacy and programming; use technology and microcomputers in a wide variety of school settings; and evaluate and create educational software materials.

Admission Requirements

Applicants must have a bachelor's degree. In addition, if the program is to be used for teacher certification purposes, the applicant must hold certification (or be certifiable) at the elementary, middle and/or high school levels.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The master's degree in computer education is conferred upon students who have successfully completed 30 credit hours including a six-credit thesis or 33 credit hours including three credits of research. A final oral examination is given during the last semester of enrollment.

Up to 12 hours of appropriate transfer credit may be applied.

Curriculum

The following core courses are required for both concentrations:

EDS	5070	Educational Statistics* 3
EDS	5095	Essentials of Educational Research* 3
EDS	5203	Theories and Trends in Education* 3
EDS	5226	Introduction to Computers in Education 3
EDS	5227	Educational Software Evaluation and Design 3
EDS	5229	Methods of Teaching Computer Literacy and Computer Science 3

** These three courses must be taken at Florida Tech. Exceptions may be considered only through a written petition to be reviewed by the department's graduate faculty.*

Students selecting the computer science certification concentration with thesis take the six core courses plus six hours of thesis (EDS 5999), a computer language course and one computer science elective, for a total of 30 hours.

Students selecting the computer science certification concentration without thesis take the six core courses plus a computer language course, one computer science elective, three hours of research (EDS 5081) and six hours of electives, for a total of 33 hours.

Students selecting the instructional technology concentration with thesis take the six core courses plus six hours of thesis (EDS 5999), a current topics in computer education course (EDS 5299) and one computer science or computer education elective, for a total of 30 hours.

Students selecting the instructional technology concentration without thesis take the six core courses plus a current topics in computer education course (EDS 5299), one computer science or computer education elective, three hours of research (EDS 5081) and six hours of electives, for a total of 33 hours.

Schedules

Any schedule that meets the above requirements within a seven-year period is acceptable. Any combination of part-time and/or full-time semesters can be used, as well as any combination of evening and summer courses. The following is an example of a full-time schedule in the computer science certification concentration without thesis:

FALL		CREDITS
CSE	xxxx Computer Language	3
EDS	5095 Essentials of Educational Research	3
EDS	5226 Introduction to Computers in Education	3
	Elective	3
		12
SPRING		
EDS	5070 Educational Statistics	3
EDS	5203 Theories and Trends in Education	3
EDS	5227 Educational Software Evaluation and Design	3
EDS	5229 Methods of Teaching Computer Literacy and Computer Science	3
		12
SUMMER		
CSE	xxxx Computer Science Elective	3
EDS	5081 Research 1	3
	Elective	3
		9

The following is an example of a full-time schedule in the instructional technology concentration without thesis:

FALL		CREDITS
EDS	5095 Essentials of Educational Research	3
EDS	5226 Introduction to Computers in Education	3
EDS	5299 Current Topics in Computer Education	3
	Elective	3
		12
SPRING		
EDS	5070 Educational Statistics	3
EDS	5203 Theories and Trends in Education	3
EDS	5227 Educational Software Evaluation and Design	3
EDS	5229 Methods of Teaching Computer Literacy and Computer Science	3
		12
SUMMER		
EDS	5081 Research 1	3
	Computer Science or Computer Education Elective	3
	Elective	3
		9
	TOTAL CREDIS REQUIRED	33

Facilities

Three technology-teaching laboratories are currently used for this program. A variety of microcomputers and other types of hardware are available for student use in the Science Education Resource Center. The resource center also includes a large number of microcomputer periodicals and current software catalogs. The Evans Library houses an additional 70-microcomputer laboratory with an extensive software library.

Departmental research includes study in a variety of aspects of computer education, educational technology and interactive videodisc production.

Environmental Education

DEPARTMENT OF SCIENCE AND MATHEMATICS EDUCATION
R.H. Fronk, Ph.D., Head

Master of Science

Program Chair

Thomas J. Marcinkowski, Ph.D.

Professor

Robert H. Fronk, Ph.D., *computer and technology education, geology/biology education, experimental design.*

Associate Professors

Michael A. Gallo, Ph.D., *instructional technology, statistics, research design.*

Thomas J. Marcinkowski, Ph.D., *environmental education, curriculum and instruction, research and evaluation design.*

Assistant Professors

Bradford Allen, Ed.D., *computer simulation, statistical research methodology, testing and evaluation, modeling.*

Richard Enstice, Ph.D., *administration in higher education, computers in education, computer networking.*

Master of Science Degree Program

The master's degree program in environmental education is for individuals with experience and/or active interest in formal programs (i.e., schools) and nonformal programs (e.g., nature/environmental centers, agencies, parks, gardens, zoos and museums). The program is designed to provide graduate education in environmental content, as well as to expand and improve environmental education teaching skills. To this end, the program includes graduate course work in environmental content, in environmental education and in educational research.

The master's degree program includes course work in an environmental content concentration. Each concentration is designed around a unifying theme for the purpose of expanding environmental knowledge and skills pertinent to that theme (e.g., a disciplinary theme such as ecology; a natural resource theme such as estuaries; or a problem-oriented theme such as water quality). Concentrations reflect the academic and research strengths of programs within the university. Programs that offer course work for inclusion in environmental content concentrations include ecology and marine biology; environmental science and environmental resources management; biological, chemical and geological oceanography; coastal zone management and marine environmental science. Further, to provide breadth to the development of knowledge and skills, concentrations are designed to include course work in each of the following

areas: ecology or another foundational science; environmental problems; environmental fieldwork or monitoring; and environmental policy, planning or management.

The master's degree program also includes course work in environmental education foundations and methods. The foundations course is designed to develop and expand knowledge of the field and of educational practices in the field from diverse perspectives. The methods courses are designed to develop and improve teaching skills. To accommodate students' differing backgrounds and interests, course projects and assignments allow students to develop and apply these skills in relevant contexts or settings.

Admission Requirements

The master's program is designed for individuals holding bachelor's degrees in areas of science, environmental studies, environmental interpretation or K-12 education. All entering students are expected to have a background in the sciences and in education that will permit them to successfully complete graduate course work. Individuals for whom this may be a concern are encouraged to discuss this directly with the program chair.

If the program is to be used for teacher certification purposes, the applicant must hold certification (or be certifiable) at the elementary, middle and/or high school levels.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog. This section also contains information on financial assistance.

Degree Requirements

The master of science degree is conferred upon students who have successfully completed 33 credit hours, as specified in the following section, and a final oral examination given during the last semester of enrollment.

Curriculum

The following courses are required:

EDS 5070 Educational Statistics* 3
EDS 5081 Research 1 3
EDS 5095 Essentials of Educational Research* 3
EDS 5410 Foundations of Environmental Education 3
EDS 5420 Methods in Ecological and Environmental Science Content 3
EDS 5430 Methods for Environmental Problems and Issue Investigation 3
EDS 5440 Methods for Citizenship and Environmental Responsibility 3

**These two courses must be taken at Florida Tech. Exceptions may be considered only through a written petition to be reviewed by the department's graduate faculty.*

In addition to these seven courses, a minimum of 12 credit hours (i.e., usually four content courses) must be taken in a chosen environmental content concentration. With departmental approval, up to six credit hours of 3000- and 4000-level course work may be included in the content concentration.

Schedules

Any schedule that would meet these requirements within a seven-year period is acceptable. Any combination of part-time and/or full-time semesters can be used, as well as any combination of daytime, evening, weekend and summer courses. The following is one example of a common schedule.

FALL	CREDITS
EDS 5410 Foundations of Environmental Education	3
Environmental Content Concentration Course	3
	6
SPRING	
EDS 5420 Methods in Ecology and Environmental Science Content	3
Environmental Content Concentration Courses	6
	9
FALL	
EDS 5095 Essentials of Educational Research	3
EDS 5430 Methods for Environmental Problems and Issue Investigation	3
Environmental Content Concentration Course	3
	9
SPRING	
EDS 5070 Educational Statistics	3
EDS 5081 Research 1	3
EDS 5440 Methods for Citizenship and Environmental Responsibility	3
	9
TOTAL CREDITS REQUIRED	33

Humanities

DEPARTMENT OF HUMANITIES AND COMMUNICATION
N.I. Matar, Ph.D., Head

Bachelor of Arts

Professors

Nabil I. Matar, Ph.D., *17th-century English literature, Anglo-Islamic history in the Renaissance, civilization of Islam.*

Gordon M. Patterson, Ph.D., *19th- and 20th-century intellectual history, American history, history of science and technology.*

Rudolph W. Stoeckel, Ph.D., *English Renaissance drama, medieval and Renaissance Tuscan history, contemporary American literature.*

Associate Professors

Randall L. Alford, Ph.D., *general linguistics, language education, German, English as a second language.*

Robert L. Shearer, Ph.D., *history of philosophy, existentialism, logic, music history and performance.*

Judith B. Strother, Ph.D., *psycholinguistics, technical communication, English for science and technology.*

Robert A. Taylor, Ph.D., *modern American history, American Civil War, Florida history.*

Jane T. Tolbert, Ph.D., *journalism, mass communication, scientific and technical communication.*

Assistant Professors

Lars Jones, Ph.D., *medieval and Renaissance European art, photojournalism, iconography.*

Alan M. Rosiene, Ph.D., *rhetorical history, history of literary theory, deconstruction, cultural studies, freshman composition.*

Peter-Otto Uhr, Ph.D., *foreign languages, literature, history.*

Adjunct Professors

D. Bailey, Ph.D.; C. Frongillo, Ph.D.

Professors Emerita

Margot A. Haberhern, Ph.D.; Jane E. Patrick, Ph.D.

Instructors

P. Bernard, M.S.; M. Denius, M.F.A.; B. Leach, M.A.; M. Mullins, M.A.; M. Ruane, M.A.; D. Russell, M.S.; J. Stottler, M.A.; J. Teegen, M.A.; F. Wallace, M.S.Ed.

Bachelor of Arts Degree Program

The major in humanities is an interdisciplinary program of liberal studies with an emphasis on literature, history, philosophy and the fine arts. As a study of the thoughts, actions and values of human beings, along with a comprehensive background in science, mathematics and computers, the humanities major has broad applicability. As a result of the ample allotment of electives, students may adapt the program to individual needs and interests. The major also prepares graduates for a wide variety of careers, including teaching, editing, scriptwriting, public relations, advertising and copywriting. Students wishing to pursue graduate study will be prepared to enter programs in their respective areas of concentration, such as history, philosophy or literature.

Degree Requirements

Candidates for a Bachelor of Arts in Humanities require a total of 120 hours for graduation as follows.

COM 1101 Composition and Rhetoric 3
COM 1102 Writing about Literature 3
COM xxxx Business and Professional Writing or Speech 3
HUM 2051 Civilization 1 3
HUM 2052 Civilization 2 3

Foreign Language (12 hours)—Four courses in the same language.

Concentration (12 hours)—2000- and higher-level courses from one of the following areas: literature, history or philosophy. The senior capstone project consists of original research resulting in a substantial written work about a significant issue in the humanities.

Humanities (27 hours)—Including at least three hours in each of the following areas: art, music, history, literature and philosophy.

Mathematics (6 hours)

Physical or Life Sciences (6 hours)

Computer Science (3 hours)

Liberal Arts Electives (24 hours)

Social Science Elective (3 hours)

Free Electives (12 hours)

Freshman Year

FALL		CREDITS
COM 1101	Composition and Rhetoric	3
CSE 1301	Introduction to Computer Applications	3
LNG xxxx	Foreign Language	3
MTH 1701	College Algebra	3
	Restricted Elective (Science)	3
		15
SPRING		
COM 1102	Writing about Literature	3
LNG xxxx	Foreign Language	3
MTH 1702	Applied Calculus	3
	Restricted Elective (Science)	3
	Free Elective	3
		15

Sophomore Year

FALL		CREDITS
COM 2224	Business and Professional Writing	3
HUM 2051	Civilization 1	3
LNG xxxx	Foreign Language	3
	Humanities Elective	3
	Liberal Arts Elective	3
		15
SPRING		
HUM 2052	Civilization 2	3
HUM xxxx	Humanities Elective	3
LNG xxxx	Foreign Language	3
	Liberal Arts Elective	3
	Social Science Elective	3
		15

Junior Year

FALL		CREDITS
	Concentration	3
HUM xxxx	Humanities Electives	6
	Liberal Arts Elective	3
	Free Elective	3
		15
SPRING		
	Concentration	3
HUM xxxx	Humanities Elective	3
	Liberal Arts Electives	6
	Free Elective	3
		15

Senior Year

FALL		CREDITS
	Concentration	3
HUM xxxx	Humanities Electives	6
	Liberal Arts Elective	3
	Free Elective	3
		15
SPRING		
HUM 4100	Senior Capstone Project	3
HUM xxxx	Humanities Electives	6
	Liberal Arts Electives	6
		15

TOTAL CREDITS REQUIRED 120

Interdisciplinary Science

DEPARTMENT OF PHYSICS AND SPACE SCIENCES
Laszlo Baksay, Ph.D., Head

Bachelor of Science
Military Science Option

Professors

Michael W. Babich, Ph.D., *chemistry.*
Laszlo Baksay, Ph.D., *physics and space sciences.*
Lt. Col. Thomas L. Tate, *military science.*
Robert H. Fronk, Ph.D., *science education.*
Nabil I. Matar, Ph.D., *humanities.*
Gary N. Wells, Ph.D., *biological sciences.*

Assistant Professor

Hector Gutierrez, Ph.D., *mechanical and aerospace engineering*

Bachelor of Science Degree Program

Because of the increasing importance of science and technology in our daily lives, Florida Tech has recognized the need for an interdisciplinary program in the sciences that allows a student to enroll in a wide variety of science and engineering courses, supplemented by certain core courses

and several carefully chosen electives. The most important characteristics of this degree are that it is flexible and tailored to the individual student's needs, and that it emphasizes broad training in science. The graduate will have a well-rounded appreciation of science and its place in society, and will have acquired specific tools for his or her career.

The bachelor's degree in interdisciplinary science is intended for students who plan graduate study in professional fields, those who are interested in a broadly based degree oriented toward the sciences or engineering, former science and engineering students who want a degree with wider scope and students seeking military careers.

Graduates normally seek employment opportunities in aerospace, environmental work, medicine and health technology, personnel work, purchasing, development, management, the military, social work, marketing—in general, a wide variety of positions requiring an interdisciplinary background-as well as opportunities for advanced study, especially in the professional fields.

Because of the great flexibility of the interdisciplinary science program, it is important that a student plan his or her program with an adviser as soon as possible. The adviser will be one of the department heads in the College of Science and Liberal Arts (listed above) or another faculty member designated by them. The student's committee will be composed of those faculty deemed most appropriate to the student's goals and objectives. A committee normally consists of three members including the adviser. The basic requirements of the degree are given below, followed by a sample four-year program. The interdisciplinary science courses are chosen by the student to conform to his or her program plan. These courses must have the approval of the student's adviser and committee, as well as the program chair. Students should start with a firm idea about the purpose of their degree and plan the program accordingly. The adviser will present some explicit four-year programs and suggest ideas about what courses are available, but each four-year program is tailored to specific needs, and therefore must be developed jointly by the student and adviser. Before enrolling for more than 30 semester credits, the student is required to file a detailed plan of study. The plan must list the courses the student wishes to take, and explain why this set of courses fulfills his or her objectives. If the objectives change, modifications of the plan of study will be allowed if approved by the student's committee. During the final semester, as part of the capstone experience, the student is required to write a paper and present it orally.

Degree Requirements

Communication (9 hours)
COM 1101 Composition and Rhetoric
COM 1102 Writing about Literature
COM 2223 Scientific and Technical Communication

Computer Science (3 hours)
CSE 1502 Introduction to Software Development/C++
or
CSE 1503 Introduction to Software Development/FORTRAN

Humanities (12 hours)
HUM 2051 Civilization 1
HUM 2052 Civilization 2
HUM 3351 History of Science and Technology 1
HUM 3352 History of Science and Technology 2

Mathematics (8 hours)
MTH 1001 Calculus 1
MTH 1002 Calculus 2

Interdisciplinary Science (44 hours)
At least 21 hours must be 3000/4000-level science courses.

Liberal Arts Electives (12 hours)
At least 6 hours must be 3000/4000-level courses, and at least 3 hours must be in the social sciences

Physical or Life Science Electives (8 hours)

Technical Electives (Science or Engineering) (22 hours)
At least 3 hours must be 3000/4000-level courses

Free Electives (6 hours)

Capstone Seminar (1 hour)
Must follow at least 37 hours of 3000- or 4000-level courses.

Freshman Year

FALL	CREDITS
COM 1101 Composition and Rhetoric	3
MTH 1001 Calculus 1	4
Physical/Life Science Electives	4
Technical Electives	4
	15
SPRING	
COM 1102 Writing about Literature	3
MTH 1002 Calculus 2	4
Physical/Life Science Electives	4
Technical Elective	4
	15

Sophomore Year

FALL	CREDITS
COM 2223 Scientific and Technical Communication	3
HUM 2051 Civilization 1	3
Interdisciplinary Science Courses	7
Technical Elective	3
	16
SPRING	
CSE 15xx Restricted Elective (Computer Science)	3
HUM 2052 Civilization 2	3
Interdisciplinary Science Course	3
Technical Electives	8
	17

Junior Year

FALL	CREDITS
HUM 3351 History of Science and Technology 1	3
Interdisciplinary Science Courses	7
Liberal Arts Elective	3
Technical Elective	3
	16
SPRING	
HUM 3352 History of Science and Technology 2	3
Interdisciplinary Science Courses	9
Liberal Arts Elective	3
	15

Senior Year

FALL	CREDITS
Interdisciplinary Science Courses	9
Liberal Arts Elective	3
Free Elective	3
	15
SPRING	
EDS 4900 Capstone Seminar	1
Interdisciplinary Science Courses	9
Liberal Arts Elective	3
Free Elective	3
	16

TOTAL CREDITS REQUIRED 125

Military Science Option

The military science option prepares Florida Tech ROTC cadets to serve as commissioned officers in the United States Army, Army Reserve and Army National Guard. Technical, scientific and military studies are incorporated into the curriculum with emphasis on applied leadership and problem solving skills. A popular option is attendance at the ROTC basic camp, "Camp Challenge," during the summer between the second and third years. This 32-day camp provides students with basic military and problem solving skills, combined with physical training.

The bachelor of science degree in interdisciplinary science, military science option, is earned by satisfying the degree requirements listed above, with 17 credits of MSC courses included in the 44 credits of interdisciplinary science electives and three credits of MSC courses included in the six credits of free electives. See the *Nondegree Programs* section of this catalog for descriptions of the ROTC program and the sequencing and descriptions of the 10 required military science courses.

DEPARTMENT OF SCIENCE AND MATHEMATICS EDUCATION

R.H. Fronk, Ph.D., Head

Mathematics Education

Bachelor of Science — *Master of Science* — *Education Specialist* — *Doctor of Education* — *Doctor of Philosophy*

Director, Teacher Education
Debra S. Blenis, M.S.

Professor
Robert H. Fronk, Ph.D., *computer and technology education, geology/biology education, experimental design.*

Associate Professors
Michael A. Gallo, Ph.D., *instructional technology, statistics, research design.*

Cecilia A. Knoll, Ph.D., *calculus mastery, differential equations, integrating technology into the curriculum.*

Thomas Marcinkowski, Ph.D., *environmental education, curriculum and instruction, research and evaluation design.*

Assistant Professors
Bradford Allen, Ed.D., *mathematics education, statistical research methodology, testing and evaluation, modeling.*

Richard E. Enstice, Ph.D., *administration in higher education, computers in education, computer networking.*

Instructor
Debra S. Blenis, M.S.

Bachelor of Science Degree Program

The recommended program plan is given below. Teacher certification areas may be Mathematics 6–12 or Middle Grades Mathematics 5–9. All applicants must meet the current entrance requirements for teacher-education programs established by the Florida Department of Education.

A full year of student teaching during the senior year provides the student with many experiences encountered in the teaching profession. To graduate from a teacher-education program approved by the Florida Board of Education, the student must meet all requirements for obtaining a Florida Educator's Certificate including completing the course work from an approved program plan with a minimum 2.5 GPA, passing the General Knowledge Skills Test, passing the Professional and Subject areas of the Florida Teacher Certification examination and earning a minimum 3.0 grade point average for 18 credit hours of student teaching. (See Chapter 6A-4.004 of the Rules of the Department of Education, State Board of Education.)

Teacher preparation programs in the State of Florida are required by Title II, section 207, of the Higher Education Act to make public their Institutional Report Cards. Florida Tech's Report Card is on our Web site: www.fit.edu/education.

Freshman Year

FALL		CREDITS
COM 1101	Composition and Rhetoric	3
EDS 1005	Introduction to Education	3
MTH 1001	Calculus 1	4
PSY 1411	Introduction to Psychology	3
		13
SPRING		
COM 1102	Writing about Literature	3
COM 2370	Speech	3
EDS 1032	Survey of Science 2	3
MTH 1002	Calculus 2	4
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
		18

Sophomore Year

FALL		CREDITS
EDS 2032	Educational Technology	3
HUM 2051	Civilization 1	3
MTH 2401	Probability and Statistics	3
MTH 2001	Calculus 3	4
PHY 2002	Physics 2	4
PHY 2092	Physics Lab 2	1
		18
SPRING		
EDS 2042	Literacy Instruction in Secondary School Content	3
HUM 3332	American History: From Reconstruction to the Present	3
MTH 2201	Differential Equations/Linear Algebra	4
MTH 4801	Advanced Geometry	3
PSY 2443	Psychology of Education	3
	or	
PSY 3421	Psychology of Learning and Motivation	3
		16

Junior Year

FALL		CREDITS
EDS 3033	Measurement and Evaluation	3
EDS 3095	Clinical and Field Experience 1	2
EDS 4051	Methods and Management of Middle and High School Teaching	4
MTH 2051	Discrete Mathematics	3
	Restricted Elective (Earth Science)	3
		15
SPRING		
EDS 3034	Assessment and Evaluation	3
EDS 3096	Clinical and Field Experience 2	2
EDS 4072	Methods and Strategies for Teaching Middle and High School Math	4
HUM 3352	History of Science and Technology: Renaissance to Present	3
HUM xxxx	Restricted Elective (Fine Arts)	3
MTH xxxx	Restricted Elective (Mathematics)	3
		18

Senior Year

FALL	CREDITS
EDS 4061 Multilingual/Multicultural Education	3
EDS 4095 Student Teaching 1	6
MTH 4101 Introductory Analysis	3
Free Elective	3
	15

SPRING	
EDS 4096 Student Teaching 2	12
	12

TOTAL CREDITS REQUIRED 125

Master of Science Degree Program

The master's program for students holding bachelor's degrees in mathematics includes advanced graduate training in mathematics, in addition to courses designed to develop and improve teaching skills. One program offers regular graduate work in mathematics while also providing the necessary course requirements for state certification of secondary school teachers. A second program is designed for those not wishing to teach in a secondary school and does not lead to certification.

The master's program for students holding bachelor's degrees in mathematics education includes courses for teachers in mathematics in addition to advanced graduate courses in mathematics education. The mathematics courses are designed to develop and upgrade subject matter knowledge. The mathematics education courses complement previous educational experience and are aimed specifically at mathematics teaching.

Admission Requirements

The master's program is designed for individuals holding bachelor's degrees either in mathematics or in middle or secondary school mathematics education.

If the program is to be used for teacher certification purposes, the applicant must hold certification (or be certifiable) at the elementary, middle and/or high school levels.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The master of science degree is conferred upon students who have successfully completed 30 credit hours including six credits of thesis, or 33 credit hours including three credits of research. A final oral examination is given during the last semester of enrollment.

Curriculum

The following courses are required, and must be taken at Florida Tech. Exceptions may be considered only through a written petition to be reviewed by the department's graduate faculty:

EDS 5070 Educational Statistics	3
EDS 5095 Essentials of Educational Research	3
EDS 5203 Theories and Trends in Education	3

A minimum of three mathematics courses (9 credit hours) is required.

A minimum of two additional graduate education courses (6 credit hours) and six credit hours of Thesis (EDS 5999) are required for the thesis option.

A minimum of three additional graduate education courses (9 credit hours), three credit hours of electives and three credit hours of Research (EDS 5081) are required for the nonthesis option.

With departmental approval, up to six credit hours of senior-level courses can be applied toward the master of science program.

Schedules

Any schedule that would meet these requirements within a seven-year period is acceptable. Any combination of part-time and/or full-time semesters may be used, as well as any combination of evening and summer courses. The following is an example of a common schedule (nonthesis option):

FALL	CREDITS
EDS 5095 Essentials of Educational Research	3
Education Electives	6
Mathematics Elective	3
	12

SPRING	
EDS 5070 Educational Statistics	3
EDS 5203 Theories and Trends in Education	3
Education Elective	3
Mathematics Elective	3
	12

SUMMER	
EDS 5081 Research 1	3
Mathematics Elective	3
Elective	3
	9

TOTAL CREDITS REQUIRED 33

Educational Specialist Degree Program

The primary emphasis of the educational specialist degree is placed on the development of specific competencies needed in mathematics education.

Admission Requirements

The applicant to the educational specialist program must hold a master's degree in mathematics or education, with mathematics as the teaching area.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

A candidate for the educational specialist degree must maintain a grade point average of 3.0 or better in a 30-credit-hour program. Although research methodologies are included in the curriculum, no thesis is required. A final examination is given in the last semester of enrollment by a three-member committee appointed by the department head and approved by the Graduate School office. A student can transfer up to 12 hours of graduate credit from other approved institutions offering at least the educational specialist degree.

Curriculum

Candidates for the educational specialist degree must complete 30 credit hours of course work beyond the master's degree as follows:

Current Research and Methodologies in Mathematics Education (9 credit hours)—Must be taken at Florida Tech; exceptions may be considered only through a written petition to be reviewed by the department's graduate faculty.

EDS 5070 Educational Statistics 3
EDS 5095 Essentials of Educational Research 3
EDS 5203 Theories and Trends in Education 3

Mathematics (9 credit hours)—The candidate must have earned a minimum of 21 graduate hours in mathematics beyond the bachelor's degree. These hours include the nine specifically required for the specialist degree and any other hours from approved postbaccalaureate mathematics courses.

Education (9 credit hours)—Approved by the head of the department.

Electives (3 credit hours)—Each student chooses an elective to fit a particular certification and/or interest area.

Doctoral Degree Programs

The doctor of philosophy (Ph.D.) and doctor of education (Ed.D.) programs are designed to provide increased competence in mathematics, mathematics education and research. Recipients gain the appropriate knowledge and skills for positions in college and university mathematics education programs; teaching, administration and supervisory posts in state and local school systems; positions teaching mathematics in liberal arts colleges and introductory mathematics courses in universities; and as research directors in mathematics education.

The primary difference between the Ph.D. and Ed.D. programs is in the focus of the dissertation work. The focus of the Ph.D. is typically theoretical, while the focus of the Ed.D. is more applied and intended for the practitioner. While Ph.D. dissertation research is oriented for the student going into a university graduate teaching and research setting, Ed.D. dissertation research is oriented for the K–12 school or business/industry practitioner and typically involves a practical field problem.

The two programs also differ in the requirement of two specialty area courses in the Ed.D. These two courses are typically in mathematics education, but may also be in science education, instructional technology or environmental education.

Doctoral students interested in theory-based research should consider the Ph.D. For those more interested in practical field research, the Ed.D. would be more appropriate.

Admission Requirements (both programs)

An applicant to the doctoral program in mathematics education must have a master's degree in mathematics or mathematics education, with a cumulative grade point average of at least 3.2 on a 4.0 scale. At least three years' teaching experience is also highly recommended.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements (both programs)

A minimum of 48 credit hours beyond the master's degree is required to earn the doctoral degree. These credits include 24 credit hours of dissertation in addition to the required course work.

REQUIRED COURSES	CREDITS
EDS 5070 Educational Statistics	3
EDS 5095 Essentials of Educational Research	3
EDS 5203 Theories and Trends in Education	3
EDS 6070 Statistics for Educational Research	3

These courses must be taken at Florida Tech. Exceptions may be considered only through a written petition to be reviewed by the department's graduate faculty.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Written comprehensives and oral comprehensives must be completed in the same semester. The doctoral comprehensive examinations are given in the last full week of September and January.

Doctor of Philosophy Curriculum

Major Technical Area—A minimum of 21 credit hours beyond the bachelor's degree must be taken in mathematics. These 21 hours may include courses from previous graduate degrees as well as courses taken as part of the Ph.D. program.

Research—A minimum of 24 credit hours must be devoted to dissertation research including at least three hours of EDS 6000 (Readings in Educational Research), at least three hours of EDS 6010 (Research Practicum) and at least 18 hours of EDS 6999 (Dissertation).

Doctor of Education Curriculum

Major Technical Area—A minimum of 18 credit hours beyond the bachelor's degree must be taken in mathematics. These 18 hours may include courses from previous graduate degrees as well as courses taken as part of the Ed.D. program.

Specialty Area—A minimum of six credit hours must be taken in mathematics education. (Specialty area credits may also be in science education, instructional technology or environmental education.)

Research—A minimum of 24 credit hours must be devoted to dissertation research including at least three hours of EDS 6000 (Readings in Educational Research), at least three hours of EDS 6010 (Research Practicum) and at least 18 hours of EDS 6999 (Dissertation). EDS 6090, a non-credit Research Seminar, is also required.

Operations Research

Master of Science *Doctor of Philosophy*

Associate Head
Michael D. Shaw, Ph.D.

Professors
Jewgeni Dshalalow, Dr. Sci., *generalized queuing systems, stochastic models.*

V. Lakshmikantham, Ph.D., *nonlinear differential equations, nonlinear game theory.*

Kamel Rekab, Ph.D., *sequential analysis, design of experiments, applied data analysis, reliability theory.*

Muzaffar A. Shaikh, Ph.D., *mathematical programming, management information systems.*

Wade H. Shaw Jr., Ph.D., *management of technology, simulation, artificial intelligence.*

Associate Professors
Martin Bohner, Ph.D., *time scales, linear dynamic systems, eigenvalue problems, variational analysis.*

Michael D. Shaw, Ph.D., *nonlinear differential equations, stability theory, variation of parameter methods, initial time difference.*

Assistant Professor
Bradford D. Allen, Ed.D., *data analysis, reliability.*

Professor Emeritus
Frederick B. Buoni, Ph.D.

Operations research is a scientific approach to analyzing problems and making decisions. It uses mathematics and mathematical modeling on computers to forecast the implications of various choices and identify the best alternatives.

Operations research methodology is applied to a broad range of problems in both the public and private sectors. These problems often involve designing systems to operate in the most effective way. Many problems deal with the allocation of scarce human resources, money, materials, equipment or facilities. Applications include staff scheduling, vehicle routing, warehouse location, product distribution, quality control, traffic light phasing, police patrolling, preventive maintenance scheduling, economic forecasting, design of experiments, power plant fuel allocation, stock portfolio optimization, cost-effective environmental protection, inventory control and university course scheduling.

Operations research is interdisciplinary and draws heavily from the mathematics program. It also uses courses from computer science, engineering management and other engineering programs.

Master of Science Degree Program

The Master of Science in Operations Research offers concentrations that emphasize those areas of application most in demand in today's job market. Graduates have skills that include probability and statistics, deterministic and stochastic models, optimization methods, computation and simulation, decision analysis and the ability to effectively communicate with clients and managers. In addition, graduates have a breadth of knowledge that allows them to work in teams, interacting with people who bring different expertise to a problem. All areas involve expertise with standard computer software packages.

Admission Requirements

An applicant for the master's program in operations research should have an undergraduate major in a science or engineering discipline that requires a significant amount of mathematics. Business majors with strong quantitative backgrounds are also encouraged to apply. A proficiency in mathematics covering topics in calculus and linear algebra and the use of a high-level programming language such as FORTRAN, Pascal or C must be demonstrated by testing or suitable course work.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The master of science degree can be pursued with either a thesis or nonthesis option; each requires 33 credit hours. Under the thesis option, up to six credit hours of thesis may be granted in place of electives toward the required 33 hours, and an oral defense is required. The nonthesis option requires a comprehensive examination. Courses taken to satisfy admission prerequisites cannot be counted toward the degree requirements.

Curriculum

The program's curriculum is designed to provide breadth with some flexibility to accommodate the diversity of backgrounds typically found in an operations research program. Greater flexibility is provided for the elective courses beyond the core. A student has the choice of developing greater depth in one area of specialization, aiming at eventual research in that area, or continuing to develop breadth across more than one area. By choosing courses in a related field of application, students can prepare for careers in specialty areas such as management science, actuarial science or economic modeling in addition to conventional areas of operations research.

Each student will complete a program plan that satisfies the requirements listed below, subject to approval of the adviser and program chair. Substitutions are sometimes permitted.

Core (12 credits)
MTH 5411 Mathematical Statistics 1
ORP 5001 Deterministic Operations Research Models
ORP 5002 Stochastic Operations Research Models
ORP 5010 Mathematical Programming
or
ORP 5003 Operations Research Practice

Restricted MTH/ORP Electives (9 credits from the following list)
MTH 5051 Applied Discrete Mathematics
MTH 5102 Linear Algebra
MTH 5401 Applied Statistical Analysis
MTH 5412 Mathematical Statistics 2
ORP 5020 Theory of Stochastic Processes
ORP 5021 Queuing Theory

Computation/Computer Science Elective (3 credits from the following list)

CSE 5100 Data Structures and Algorithms
CSE 5210 Formal Languages and Automata Theory
CSE 5211 Analysis of Algorithms
CSE 5290 Artificial Intelligence
CSE 5610 Computational Complexity
MTH 5301 Numerical Analysis
MTH 5305 Numerical Linear Algebra
MTH 5320 Neural Networks
ORP 5050 Discrete System Simulation

Free Electives (9 credits)

Nonthesis option—Three courses in areas of interest to the student as approved in the student's program plan.

Thesis option—At least one course plus up to six credits for a thesis. The thesis should be an in-depth study of some topic and/or problem in operations research, subject to the approval of the thesis committee.

Doctor of Philosophy Degree Program

The doctor of philosophy program provides a more advanced level of education, as well as demonstrated ability to perform independent research. These additional strengths should qualify the graduate for vital positions of leadership in industry, business, government and academia.

Admission Requirements

An applicant for the doctoral program will normally have completed a master's degree in operations research or a related discipline. If the master's degree is not in operations research, then the student will be required to take the core courses for Florida Tech's master's degree in operations research. These courses may be used toward fulfilling the credit requirements for the Ph.D. in operations research. Students also will be required to take a written qualifying examination equivalent to Florida Tech's master's comprehensive examination.

General admission requirements are discussed in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

A minimum of 48 credit hours beyond the requirements for the master's degree is required to earn the doctoral degree. These credits include 24 credit hours of dissertation research in addition to normal course work.

Each student must 1) complete an approved program of study; 2) pass a comprehensive examination; 3) complete a program of significant original research; and 4) defend the dissertation concerning the research work completed.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

The individual doctoral program of study must be approved by the student's doctoral committee and the program chair. Students who have not taken MTH 5001 and MTH 5102, or their equivalents, will be required to take them. Students will also be required to take at least two courses from the Computation/Computer Science list above.

The doctoral program in operations research does not fall within the traditional boundaries of a single discipline. The scope is broad and interdisciplinary. Consequently, every course in a student's program of study is evaluated in terms of how it complements other courses and provides breadth and depth to the program. Considerable latitude is permitted in course selection provided the core requirements for operations research/mathematics/computation are met. The remaining courses are selected in collaboration with the Doctoral Committee according to the interests and research objectives of the student.

Research

Current active research efforts include the modeling of controlled queuing systems, stochastic processes, applied statistics, design of experiments, neural networks, parallel processing and algorithms, decision-making under uncertainty, simulation, engineering management, quality control, optimization models and methods, scheduling and timetabling algorithms, applied graph theory and integer programming.

Physics

DEPARTMENT OF PHYSICS AND SPACE SCIENCES
Laszlo Baksay, Ph.D., Head

Bachelor of Science *Master of Science* *Doctor of Philosophy*
Preprofessional Physics Option

Professors

Laszlo Baksay, Ph.D., *experimental high-energy physics at LHC and LEP/CERN, detector development, maglev.*

Terry D. Oswalt, Ph.D., *stellar spectroscopy and photometry, white dwarf stars, binary stars, stellar activity, minor planets and comets.*

Associate Professors

Marc M. Baarmand, Ph.D., *experimental particle physics at Fermi National Accelerator Laboratory and CERN.*

Rong-sheng Jin, Ph.D., *terrestrial geomagnetism, especially changes in the Earth's field with time; correlation with Earth's rotation rate.*

Hamid K. Rassoul, Ph.D., *observation and modeling of magnetic storms and substorms, photochemistry of the earth's upper-atmosphere, solar wind-magnetosphere interactions, upward propagating lightning.*

Matthew A. Wood, Ph.D., *astrophysics, theory and observations of white dwarf stars, cataclysmic variables.*

Ming Zhang, Ph.D., *cosmic radiation and interactions with the plasma and magnetic fields in the interstellar medium, the heliosphere and magnetospheres.*

Assistant Professors

Joseph R. Dwyer, Ph.D., *space physics, solar and heliospheric energetic particle observations, space instrumentation, upward propagating lightning.*

Marcus Hohlman, Ph.D., *particle physics, experimental high-energy physics with L3 and CMS experiments at CERN, development of particle detectors.*

James G. Mantovani, Ph.D., *condensed matter theory and experiment, particularly surface physics and electron microscopy.*

Benjamin M. Sawyer, M.S., *physics education.*

Visiting Assistant Professor
Sandra Clements, Ph.D., *observational astronomy, variability studies of quasars, blazars and other active galactic nuclei.*

Adjunct Professor
Marcelo Alonso, Ph.D.

Professors Emeriti
Joel H. Blatt, Ph.D., Jay Burns, Ph.D.; James D. Patterson, Ph.D.

Director of Undergraduate Laboratories
J.A. Gering, M.S.

Bachelor of Science Degree Program

Physics is the discipline most directly concerned with understanding the physical world on a fundamental level. As such, it covers an extremely broad range of subjects and areas of specialization that seek to unify and understand this diversity in terms of the smallest possible number of laws and principles. A physicist must, therefore, receive a broad, general training in science. Mathematics, a primary tool, must be developed, as well as experimental laboratory skills. Most important is the development of a variety of problem-solving skills and a critical, incisive approach to physical problems. The curriculum includes core courses in physics, mathematics and related sciences, plus a liberal mixture of applied courses from engineering fields and an enriching selection of humanities electives. Students considering a career in medicine or other health sciences should consider the physics preprofessional option detailed below. A degree in physics provides an excellent background for entering the health sciences.

Undergraduate Research

A major activity of the department is research. The department possesses good instrumentation required for research in selected areas of physics. Participation in research programs by undergraduates is strongly encouraged. A maximum of six semester hours of research can be used to fulfill technical and free elective requirements.

Degree Requirements

Candidates for the Bachelor of Science in Physics must complete the course requirements listed in the following sample curriculum. Because the subject matter of general physics forms a critically important foundation for all advanced physics courses, the minimum grade for satisfying the prerequisite requirements for a physics major is a grade of C for each of the following courses: PHY 1001, PHY 2002, PHY 2003, PHY 2091 and PHY 2092.

Freshman Year

FALL	CREDITS
CHM 1101 Chemistry 1	4
COM 1101 Composition and Rhetoric	3
MTH 1001 Calculus 1	4
PHY 1050 Physics and Space Science Seminar	1
SPS 1010 Introduction to Astronomy	3
	15

SPRING	
CHM 1102 Chemistry 2	4
COM 1102 Writing about Literature	3
MTH 1002 Calculus 2	4
PHY 1001 Physics 1	4
PHY 2091 Physics Lab 1	1
	16

Sophomore Year

FALL	CREDITS
CSE 15xx Restricted Elective (Computer Science)	3
HUM 2051 Civilization 1	3
MTH 2001 Calculus 3	4
PHY 2002 Physics 2	4
PHY 2092 Physics Lab 2	1
	15

SPRING	
HUM 2052 Civilization 2	3
MTH 2201 Differential Equations/Linear Algebra	4
PHY 2003 Modern Physics	3
Social Sciences Elective	3
Free Elective	3
	16

Junior Year

FALL	CREDITS
COM 2223 Scientific/Technical Communication	3
MTH 3101 Complex Variables	3
PHY 3011 Physical Mechanics	4
PHY 3060 Thermodynamics, Kinetic Theory and Statistical Mechanics	4
Free Elective	3
	17

SPRING	
MTH 3201 Boundary Value Problems	3
PHY 3035 Quantum Mechanics	4
PHY 3152 Electronic Measurement Techniques	4
PHY 3440 Electromagnetic Theory	3
Humanities Elective	3
	17

Senior Year

FALL	CREDITS
PHY 4020 Optics	3
PHY 4021 Experiments in Optics	1
PHY 4033 Introduction to Solid State Physics	3
PHY 4200 Senior Seminar 1	1
Restricted Elective (MTH or CSE)	3
Technical Elective or Senior Research	3
Free Elective	3
	17

SPRING	
PHY 4030 Introduction to Subatomic Physics	3
PHY 4071 Senior Lab 2	2
PHY 4210 Senior Seminar 2	1
Free Elective	3
Humanities or Social Science Elective	3
Technical Elective or Senior Research	3
	15

TOTAL CREDITS REQUIRED 128

Preprofessional Physics Option

This option offers the courses needed to meet the entrance requirements of essentially all schools of medicine, dentistry, osteopathic medicine, podiatry and optometry, as well as the nonagricultural courses for veterinary medicine. The preprofessional adviser has up-to-date information on admission requirements for most professional schools, including appropriate admission tests. The preprofessional committee provides the professional schools with required evaluations of student performance. A student contemplating admission to a professional school should consult the preprofessional adviser early in the program.

Freshman Year

FALL	CREDITS
BIO 1010 Biological Discovery 1	4
CHM 1101 Chemistry 1	4
COM 1101 Composition and Rhetoric	3
MTH 1001 Calculus 1	4
PHY 1050 Physics and Space Science Seminar	1
	16

SPRING	
BIO 1020 Biological Discovery 2	4
BIO 1200 Introduction to the Health Professions	1
CHM 1102 Chemistry 2	4
MTH 1002 Calculus 2	4
PHY 1001 Physics 1	4
	17

Sophomore Year

FALL	CREDITS
CHM 2001 Organic Chemistry 1	3
CHM 2011 Organic Chemistry Lab 1	2
COM 1102 Writing about Literature	3
MTH 2001 Calculus 3	4
PHY 2002 Physics 2	4
PHY 2091 Physics Lab 1	1
	17

SPRING	
CHM 2002 Organic Chemistry 2	3
CHM 2012 Organic Chemistry Lab 2	2
COM 2223 Scientific/Technical Communication	3
MTH 2201 Differential Equations/Linear Algebra	4
PHY 2003 Modern Physics	3
PHY 2092 Physics Lab 2	1
	16

Junior Year

FALL	CREDITS
HUM 2051 Civilization 1	3
MTH 3201 Boundary Value Problems	3
PHY 3011 Physical Mechanics	4
PHY 3060 Thermodynamics, Kinetic Theory and Statistical Mechanics	4
Technical Elective*	3
	17

SPRING	
HUM 2052 Civilization 2	3
PHY 3035 Quantum Mechanics	4
PHY 3152 Electronic Measurement Techniques	4
PHY 3440 Electromagnetic Theory	3
Technical Elective*	3
	17

Senior Year

FALL	CREDITS
PHY 4020 Optics	3
PHY 4021 Experiments in Optics	1
PHY 4033 Introduction to Solid State Physics	3
or Technical Elective	3
or Senior Research	3
PHY 4200 Senior Seminar 1	1
Humanities Elective	3
Technical Elective*	3
	14

SPRING	
CSE 1301 Introduction to Computer Applications	3
PHY 4030 Introduction to Subatomic Physics	3
or Technical Elective	3
PHY 4071 Senior Lab 2	2
PHY 4210 Senior Seminar 2	1
Social Science Elective	3
Technical Elective	3
	15

TOTAL CREDITS REQUIRED 129

**BIO 2010, BIO 2110 and BIO 3210 are recommended as Technical Electives.*

Master of Science Degree Program

Graduate study in physics at the master's level generally follows one of two tracks. It either aims to provide a sound core-course education in several fundamental, broad areas of physics at an advanced level to prepare the student for continued and specialized study toward the doctorate, or it may be directed toward preparing the student to apply physics in industry or in other nonacademic environments. Course work for the latter track tends to be more specialized and narrowly oriented. The master of science program in physics attempts to serve both types of objectives and offers a balanced combination of basic core courses and those designed for applied physicists.

Admission Requirements

An applicant for admission should have an undergraduate major in physics, mathematics or an engineering field, and should submit Graduate Record Examination (GRE) scores from both the General Test and the Subject Test in physics. All entering physics graduate students are required to be prepared in mathematics at least through vector analysis.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The master's degree is conferred on students who have satisfactorily completed a minimum of 33 credit hours of graduate study. A master's thesis is optional.

The six-credit sequence MTH 5201, MTH 5202 (Math Methods in Science and Engineering), is required unless equivalent courses have already been taken. The other 27 credits required for the degree are to be taken from courses on the following list, all of which are given at least every other year on a rotating schedule.

ECE 5410 Electrodynamics 1	3
ECE 5411 Electrodynamics 2	3
PHY 5015 Analytical Mechanics 1	3
PHY 5030 Quantum Mechanics 1	3
PHY 5031 Quantum Mechanics 2	3
PHY 5035 Solid State Physics 1	3
PHY 5036 Solid State Physics 2	3
PHY 5045 Introduction to Elementary Particle Physics	3
PHY 5080 Thermodynamics	3
PHY 5081 Statistical Mechanics	3
PHY 5999 Thesis	3–6

Students who do not plan to go beyond the master's degree can substitute other courses for the courses listed above with the approval of the department head. Up to six semester hours of credit may be earned in thesis research and preparation. Students not taking the thesis option must take three semester hours of graduate laboratory work unless excused by the department head.

A general written examination is required in the second semester of residence for the purpose of diagnosing any deficiencies in undergraduate preparation. Any deficiencies must be removed before a degree will be granted, as evidenced by written examination.

Before the master's degree is granted, the student must pass a final oral examination administered by a committee of three or more members of the graduate faculty selected by

the student and the departmental adviser and including at least one member from outside the physics department. The oral examination emphasizes, but is not necessarily restricted to, subject matter related to the field of the thesis. For students not electing to do a thesis, the oral examination covers the general area of the student's graduate studies.

Doctor of Philosophy Degree Program

The doctoral degree is conferred primarily to recognize the individual who has demonstrated a satisfactory breadth and level of scientific accomplishment and has the ability to investigate scientific problems independently. It is also expected that the successful candidate for the degree will have advanced or played a significant part in the advancement of fundamental knowledge in physics.

Admission Requirements

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog. Applicants should submit Graduate Record Examination (GRE) scores from both the General Test and the Subject Test in physics.

Degree Requirements

Each candidate for the doctoral degree must prepare and carry out a program of study approved by the major adviser and the department head, pass a departmental qualifying examination, pass a written doctoral comprehensive examination, submit a dissertation proposal that gains the approval of the student's Doctoral Committee, complete a program of significant original research, and write and successfully defend a dissertation based on the program of research. The dissertation research, or a significant portion thereof, must have been accepted for publication in a major, refereed journal before the degree can be awarded.

The Doctor of Philosophy in Physics is by nature a research degree and the formal course requirements are kept to a minimum. At least 81 credits beyond the bachelor's degree (or 48 beyond the master's) are required, including credits for individual study, research and dissertation. At least 24 of these credits must be formal classroom courses that may include courses for the master's degree and must include at least 18 credits taken at Florida Tech. Each of the following courses must be taken if credit for equivalent material was not previously earned.

PHY 5015 Analytical Mechanics 1 3
PHY 5030 Quantum Mechanics 1 3
PHY 5031 Quantum Mechanics 2 3
PHY 5080 Thermodynamics 3
PHY 5081 Statistical Mechanics 3

After completing formal course work, the student must pass a written comprehensive examination emphasizing the student's major area of concentration and an acceptable dissertation proposal must be submitted before the student is formally admitted to candidacy.

An applicant without a master's degree is normally required to spend some time in residence at Florida Tech, preferably by obtaining the master's degree, before being accepted into the doctoral program in physics.

Research Activities and Facilities

Current research activities include experimental solid-state physics, terrestrial geomagnetism, auroral and magnetospheric physics, applied optics, experimental high-energy physics, instrumentation development, solar and heliospheric energetic particle observations and cosmic ray physics.

Experimental research in physics is carried out in a variety of laboratories operated by the department of physics and space sciences, as well as at national and international research facilities. Facilities that are currently available to graduate students include the following laboratories.

Applied Optics Laboratory

This facility offers the study of applied optics in physics and space sciences, including 3-D vision and imaging spectroscopy.

Noncontact laser video systems are being studied for applications such as remote measurement of surface shapes. These studies are carried out in an applied optics laboratory equipped with lasers and other sources, two large isolation tables and computer-interfaced and optically processed video systems.

High-Energy Physics Lab

This lab is centered around the L3 and CMS experiments at the European Center for Particle Physics (CERN) using LEP, the world's highest energy accelerator colliding electrons and positrons, and using LHC, which will provide the world's highest energy proton-proton collisions, scheduled to start running in 2006. L3 and CMS are international collaborations of scientists whose goal is to make precise measurements of the laws governing the known elementary particles and the forces between them, as well as to search for new phenomena such as the Higgs and supersymmetric particles. In this research, an important role is taken by the design and building of instrumentation using new technologies and methods. The activities are carried out on campus and at CERN.

Florida Tech is the lead institution on L3 responsible for precision monitoring of the electron drift velocity in the large outer drift chamber system and for the optical alignment system of the silicon microvertex detector.

The Florida Tech High Energy Physics Group is also responsible for construction and testing of a laser calibration system for the forward hadron calorimeter of the CMS detector.

Scanning Probe Microscopy Laboratory

This facility provides researchers with the ability to image the surface structure of a solid, and to probe the electronic surface properties of a material down to the atomic scale, using a scanning tunneling microscope (STM). This laboratory also investigates novel applications of the STM (e.g., in the field of electrochemistry) and is interested in the development of other types of scanning probe microscopes.

Computational Facilities

The department's facilities include a network of LINUX workstations. A National Science Foundation-funded computational physics lab consisting of 12 Pentium PCs capable of running LINUX/X-Windows and MS Windows is available to students.

Interdisciplinary Research in Physics and Space Sciences

Terrestrial geomagnetic research is aimed at extracting long-term periodicities in changes in the Earth's magnetic field and correlation between secular changes in the geomagnetic field and fluctuations in the length of the day.

Auroral and magnetospheric research is being done using data from polar orbiting satellites. Current work concentrates on auroral electron and proton precipitating particle energies, intensities and distribution in latitude, with relation to magnetic substorms in the magnetosphere. Space-based energetic particle observations are aimed at understanding acceleration and propagation of particles in the heliosphere.

In addition, the department's space science laboratories are used by physics students from time to time. See the "Research Fcilities" listing under Space Sciences.

Teaching and Research Assistantships

The department offers a number of teaching and research assistantships each year. Teaching assistants participate in laboratory instruction or in the preparation of teaching materials. Research assistants work on research projects that are often related to their own master's thesis or doctoral dissertation investigations. Both types of assistantships are awarded on a competitive basis, and provide graduate course fee remission and a stipend for living expenses. To increase the probability of receiving an assistantship, applicants are advised to apply as early as possible in the academic year prior to requested admission.

Science Education

DEPARTMENT OF SCIENCE AND MATHEMATICS EDUCATION
R.H. Fronk, Ph.D., Head

Bachelor of Science
Options in:
Biology
Chemistry
Computer Science
Earth/Space Science
General Science
Physics

Master of Science
Concentrations in:
Biology
Chemistry
Environmental Science
General Science
Oceanography/Earth Science
Physics

Educational Specialist
Doctor of Education
Doctor of Philosophy

Director, Teacher Education
Debra S. Blenis, M.S.

Professor
Robert H. Fronk, Ph.D., *computer and technology education, geology/biology education, experimental design.*

Associate Professors
Michael A. Gallo, Ph.D., *instructional technology, statistics, research design.*

Thomas Marcinkowski, Ph.D., *environmental education, curriculum and instruction, research and evaluation design.*

Assistant Professor
Richard E. Enstice, Ph.D., *administration in higher education, computers in education, computer networking.*

Professor Emeritus
Robert F. Richmond, Ed.S.

Instructor
Debra S. Blenis, M.S.

Bachelor of Science Degree Program

The curriculum leads to a bachelor of science degree with options in biology, chemistry, computer science, earth and space science, physics and middle grades general science. All applicants must meet the current entrance requirements for teacher-education programs established by the Florida Department of Education.

A full year of student teaching during the senior year provides the student with many experiences encountered in the teaching profession. To graduate from a teacher-education program approved by the Florida Board of Education, the student must meet all requirements for obtaining a Florida Educator's Certificate, including completing the course work from an approved program plan with a minimum 2.5 GPA, passing the General Knowledge Test, passing the Professional and Subject areas of the Florida Teacher Certification examination and earning a minimum 3.0 grade point average for 18 credit hours of student teaching. (See Chapter 6A-4.004 of the Rules of the Department of Education, State Board of Education.)

Teacher preparation programs in the State of Florida are required by Title II, section 207, of the Higher Education Act to make public their Institutional Report Cards. Florida Tech's Report Card is on our Web site: www.fit.edu/education.

Biology Option

Freshman Year

FALL		CREDITS
BIO 1010	Biological Discovery 1	4
COM 1101	Composition and Rhetoric	3
EDS 1005	Introduction to Education	3
MTH 1001	Calculus 1	4
PSY 1411	Introduction to Psychology	3
		17

SPRING		
BIO 1020	Biological Discovery 2	4
COM 1102	Writing about Literature	3
COM 2370	Speech	3
MTH 1002	Calculus 2	4
	Free Elective	3
		17

Sophomore Year

FALL		CREDITS
BIO 1500	Introduction to Aquaculture	1
BIO 2110	General Genetics	4
CHM 1101	Chemistry 1	4
EDS 2032	Educational Technology	3
HUM 2051	Civilization 1	3
HUM xxxx	Restricted Elective (Fine Arts)	3
		18

SPRING

CHM 1102 Chemistry 2 4
EDS 2042 Literacy Instruction in Secondary School Content 3
HUM 3332 American History: Reconstruction to the Present 3
PHY 1001 Physics 1 4
PHY 2091 Physics Lab 1 1
PSY 2443 Psychology of Education 3
or
PSY 3421 Psychology of Learning and Motivation 3

18

Junior Year

FALL CREDITS

BIO xxxx Restricted Elective (Biology) 3
CHM 2001 Organic Chemistry 1 3
EDS 3033 Measurement and Evaluation 3
EDS 3095 Clinical and Field Experience 1 2
EDS 4051 Methods and Management of Middle and High School Teaching 4

15

SPRING

BIO 2010 Microbiology 4
EDS 3034 Assessment and Evaluation 3
EDS 3096 Clinical and Field Experience 2 2
EDS 4071 Methods and Strategies for Teaching Middle and High School Science 4
HUM 3352 History of Science and Technology: Renaissance to Present 3

16

Senior Year

FALL CREDITS

BIO xxxx Restricted Electives (Biology) 3
EDS 4061 Multilingual/Multicultural Education 3
EDS 4095 Student Teaching 1 6
Restricted Elective (Earth Science) 3

15

SPRING

EDS 4096 Student Teaching 2 12

12

TOTAL CREDITS REQUIRED 128

Chemistry Option

Freshman Year

FALL CREDITS

BIO 1010 Biological Discovery 1 4
CHM 1101 Chemistry 1 4
COM 1101 Composition and Rhetoric 3
EDS 1005 Introduction to Education 3
MTH 1001 Calculus 1 4

18

SPRING

CHM 1102 Chemistry 2 4
COM 1102 Writing about Literature 3
COM 2370 Speech 3
MTH 1002 Calculus 2 4
Free Elective 3

17

Sophomore Year

FALL CREDITS

EDS 2032 Educational Technology 3
MTH 2001 Calculus 3 4
PHY 1001 Physics 1 4
PHY 2091 Physics Lab 1 1
PSY 1411 Introduction to Psychology 3
Restricted Elective (Earth Science) 3

18

SPRING

CHM 2001 Organic Chemistry 1 3
CHM 2011 Organic Chemistry Lab 1 2
EDS 2042 Literacy Instruction in Secondary School Content 3
HUM 2051 Civilization 1 3
PHY 2002 Physics 2 4
PSY 2443 Psychology of Education 3
or
PSY 3421 Psychology of Learning and Motivation 3

18

Junior Year

FALL CREDITS

CHM 2002 Organic Chemistry 2 3
CHM 2012 Organic Chemistry Lab 2 2
EDS 3033 Measurement and Evaluation 3
EDS 3095 Clinical and Field Experience 1 2
EDS 4051 Methods and Management of Middle and High School Teaching 4
HUM xxxx Restricted Elective (Fine Arts) 3

17

SPRING

EDS 3034 Assessment and Evaluation 3
EDS 3096 Clinical and Field Experience 2 2
EDS 4071 Methods and Strategies for Teaching Middle and High School Science 4
HUM 3332 American History: Reconstruction to the Present 3
HUM 3352 History of Science and Technology: Renaissance to Present 3

15

Senior Year

FALL CREDITS

CHM 3001 Physical Chemistry 1 3
CHM 3011 Physical Chemistry Lab 1 2
EDS 4061 Multilingual/Multicultural Education 3
EDS 4095 Student Teaching 1 6

14

SPRING

EDS 4096 Student Teaching 2 12

12

TOTAL CREDITS REQUIRED 129

Computer Science Option

Freshman Year

FALL CREDITS

COM 1101 Composition and Rhetoric 3
CSE 1001 Fundamentals of Software Development 1 4
EDS 1005 Introduction to Education 3
MTH 1001 Calculus 1 4
Restricted Elective (Earth Science) 3

17

SPRING

COM 1102 Writing about Literature 3
COM 2370 Speech 3
CSE 1002 Fundamentals of Software Development 2 4
EDS 1032 Survey of Science 2 3
MTH 1002 Calculus 2 4

17

Sophomore Year

FALL CREDITS

CSE 1101 Computing Disciplines and Careers 1
CSE xxxx Restricted Elective (CSE) 3
EDS 2032 Educational Technology 3
HUM 2051 Civilization 1 3
PHY 1001 Physics 1 4
PHY 2091 Physics Lab 1 1
PSY 1411 Introduction to Psychology 3

18

SPRING

CSE xxxx Restricted Elective (CSE) 3
EDS 2042 Literacy Instruction in Secondary School Content 3
HUM 3332 American History: Reconstruction to the Present 3
PSY 2443 Psychology of Education 3
or
PSY 2441 Child and Adolescent Development 3
HUM xxxx Restricted Elective (Fine Arts) 3
15

Junior Year

FALL CREDITS

CSE 2010 Algorithms and Data Structures 4
EDS 3033 Measurement and Evaluation 3
EDS 3095 Clinical and Field Experience 1 2
EDS 4051 Methods and Management of Middle and High School Teaching 4
MTH 2401 Probability and Statistics 3
16

SPRING

CSE 2410 Introduction to Software Engineering 3
CSE xxxx Restricted Electives (Computer Science) 3
EDS 3034 Assessment and Evaluation 3
EDS 3096 Clinical and Field Experience 2 2
EDS 4073 Methods and Strategies for Teaching Computer Science K–12 4
HUM 3352 History of Science and Technology: Renaissance to Present 3
18

Senior Year

FALL CREDITS

CSE xxxx Restricted Electives (Computer Science) 3
EDS 4061 Multilingual/Multicultural Education 3
EDS 4095 Student Teaching 1 6
Free Elective 3
15

SPRING

EDS 4096 Student Teaching 2 12
12

TOTAL CREDITS REQUIRED 128

Earth/Space Science Option

Freshman Year

FALL CREDITS

CHM 1101 Chemistry 1 4
COM 1101 Composition and Rhetoric 3
EDS 1005 Introduction to Education 3
ENS 1001 The Whole Earth Course 3
MTH 1001 Calculus 1 4
17

SPRING

BIO 1020 Biological Discovery 2 4
CHM 1102 Chemistry 2 4
COM 1102 Writing about Literature 3
MTH 1002 Calculus 2 4
SPS 1020 Introduction to Space Sciences 3
18

Sophomore Year

FALL CREDITS

BIO 1010 Biological Discovery 1 4
EDS 2032 Educational Technology 3
PHY 1001 Physics 1 4
PHY 2091 Physics Lab 1 1
PSY 1411 Introduction to Psychology 3
SPS 1010 Introduction to Astronomy 3
18

SPRING

COM 2370 Speech 3
EDS 2042 Literacy Instruction in Secondary School Content 3
HUM 2051 Civilization 1 3
OCN 2407 Meteorology 3
PSY 2443 Psychology of Education 3
or
PSY 3421 Psychology of Learning and Motivation 3
SPS 2010 Observational Astronomy 3
18

Junior Year

FALL CREDITS

EDS 3033 Measurement and Evaluation 3
EDS 3095 Clinical and Field Experience 1 2
EDS 4051 Methods and Management of Middle and High School Teaching 4
OCN 2602 Environmental Geology 3
HUM xxxx Restricted Elective (Fine Arts) 3
15

SPRING

EDS 3034 Assessment and Evaluation 3
EDS 3096 Clinical and Field Experience 2 2
EDS 4071 Methods and Strategies for Teaching Middle and High School Science 4
ENS 4001 The Earth System 3
HUM 3332 American History: Reconstruction to the Present 3
HUM 3352 History of Science and Technology: Renaissance to Present 3
18

Senior Year

FALL CREDITS

EDS 4061 Multilingual/Multicultural Education 3
EDS 4095 Student Teaching 1 6
Free Elective 3
12

SPRING

EDS 4096 Student Teaching 2 12
12

TOTAL CREDITS REQUIRED 128

General Science Option

Freshman Year

FALL CREDITS

CHM 1101 Chemistry 1 4
COM 1101 Composition and Rhetoric 3
EDS 1005 Introduction to Education 3
ENS 1001 The Whole Earth Course 3
MTH 1001 Calculus 1 4
17

SPRING

CHM 1102 Chemistry 2 4
COM 1102 Writing about Literature 3
COM 2370 Speech 3
MTH 1002 Calculus 2 4
SPS 1020 Introduction to Space Sciences 3
17

Sophomore Year

FALL CREDITS

BIO 1010 Biological Discovery 1 4
CHM 2001 Organic Chemistry 1 3
EDS 2032 Educational Technology 3
PSY 1411 Introduction to Psychology 3
SPS 1010 Introduction to Astronomy 3
16

SPRING

BIO 1020 Biological Discovery 2 4
EDS 2042 Literacy Instruction in Secondary School Content 3
HUM 2051 Civilization 1 3
PHY 1001 Physics 1 4
PHY 2091 Physics Lab 1 1
PSY 2443 Psychology of Education 3
or
PSY 2441 Child and Adolescent Development 3
18

Junior Year

FALL	CREDITS
EDS 3033 Measurement and Evaluation	3
EDS 3095 Clinical and Field Experience 1	2
EDS 4051 Methods and Management of Middle and High School Teaching	4
OCN 2602 Environmental Geology	3
HUM xxxx Restricted Elective (Fine Arts)	3
	15

SPRING	
EDS 3034 Assessment and Evaluation	3
EDS 3096 Clinical and Field Experience 2	2
EDS 4071 Methods and Strategies for Teaching Middle and High School Science	4
HUM 3332 American History: Reconstruction to the Present	3
HUM 3352 History of Science and Technology: Renaissance to Present	3
OCN 2407 Meteorology	3
	18

Senior Year

FALL	CREDITS
EDS 4061 Multilingual/Multicultural Education	3
EDS 4095 Student Teaching 1	6
Technical Electives	3
Free Elective	3
	15

SPRING	
EDS 4096 Student Teaching 2	12
	12

TOTAL CREDITS REQUIRED 128

Physics Option

Freshman Year

FALL	CREDITS
BIO 1010 Biological Discovery 1	4
COM 1101 Composition and Rhetoric	3
EDS 1005 Introduction to Education	3
MTH 1001 Calculus 1	4
PSY 1411 Introduction to Psychology	3
	17

SPRING	
COM 1102 Writing about Literature	3
COM 2370 Speech	3
MTH 1002 Calculus 2	4
PHY 1001 Physics 1	4
PHY 2091 Physics Lab 1	1
PSY 2443 Psychology of Education	3
or	
PSY 3421 Psychology of Learning and Motivation	3
	18

Sophomore Year

FALL	CREDITS
CHM 1101 Chemistry 1	4
EDS 2032 Educational Technology	3
HUM 2051 Civilization 1	3
MTH 2001 Calculus 3	4
PHY 2002 Physics 2	4
	18

SPRING	
CHM 1102 Chemistry 2	4
EDS 2042 Literacy Instruction in Secondary School Content	3
HUM 3332 American History: Reconstruction to the Present	3
MTH 2201 Differential Equations/Linear Algebra	4
PHY 2003 Modern Physics	3
	17

Junior Year

FALL	CREDITS
EDS 3033 Measurement and Evaluation	3
EDS 3095 Clinical and Field Experience 1	2
EDS 4051 Methods and Management of Middle and High School Teaching	4
PHY 2092 Physics Lab 2	1
PHY 3011 Physical Mechanics	4
Restricted Elective (Fine Arts)	3
	17

SPRING	
EDS 3034 Assessment and Evaluation	3
EDS 3096 Clinical and Field Experience 2	2
EDS 4071 Methods and Strategies for Teaching Middle and High School Science	4
HUM 3352 History of Science and Technology: Renaissance to Present	3
PHY 3035 Quantum Mechanics	4
	16

Senior Year

FALL	CREDITS
EDS 4061 Multilingual/Multicultural Education	3
EDS 4095 Student Teaching 1	6
Free Elective	3
Restricted Elective (Earth Science)	3
	15

SPRING	
EDS 4096 Student Teaching 2	12
	12

TOTAL CREDITS REQUIRED 130

Master of Science Degree Program

The master's program for students holding bachelor's degrees in science includes advanced graduate training in a science field in addition to courses designed to develop and improve teaching skills. One program offers graduate work in science while also providing the necessary course requirements for state certification of secondary school teachers. A second program is designed for those not wishing to teach in a secondary school and does not lead to certification.

The master's program for students holding bachelor's degrees in science education includes science courses for teachers in a selected science area in addition to advanced graduate courses in science education. The science courses are designed to develop and upgrade subject matter knowledge in specific, selected areas of science. The science education courses will complement previous educational experience and are aimed specifically at science teaching.

Admission Requirements

The master's program is designed for individuals holding bachelor's degrees either in areas of science or in secondary school science education.

If the program is to be used for teacher certification purposes, the applicant must hold certification (or be certifiable) at the elementary, middle and/or high school levels.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The master of science degree is conferred upon students who have successfully completed 30 credit hours including six credits of thesis, or 33 credit hours including three credits of research. A final oral examination is given during the last semester of enrollment.

Curriculum

The following courses are required, and must be taken at Florida Tech. Exceptions may be considered only through a written petition, reviewed by the department's graduate faculty:

EDS 5070 Educational Statistics 3
EDS 5095 Essentials of Educational Research 3
EDS 5203 Theories and Trends in Education 3

A minimum of three science courses (9 credit hours) is required. These courses are to be in the selected concentration area: biology, chemistry, environmental science, physics, oceanography/earth science or general science (for middle- and junior-high school teachers). Each concentration area corresponds to a degree program at Florida Tech, with the exception of general science. Any graduate course taken in a science department will qualify as a science course in the corresponding concentration. In addition, science courses offered through the science education department, specifically for teachers, may also be used to partially fulfill the science course requirement. The general science concentration involves several areas and will be constructed based on the student's needs.

A minimum of two additional graduate science education courses (6 credit hours) and six credit hours of Thesis (EDS 5999) are required for the thesis track.

A minimum of three additional graduate science education courses (9 credit hours), three credit hours of electives and three credit hours of Research (EDS 5081) are required for the nonthesis track.

With departmental approval, up to six credit hours of senior-level courses can be applied toward the master of science program.

Schedules

Any schedule that would meet these requirements within a seven-year period is acceptable. Any combination of part-time and/or full-time semesters can be used, as well as any combination of evening and summer courses. Following is an example of a common schedule (nonthesis option):

FALL	CREDITS
EDS 5095 Essentials of Educational Research	3
Science Course in Concentration	3
Science Education Electives	6
	12

SPRING	
EDS 5070 Educational Statistics	3
EDS 5203 Theories and Trends in Education	3
Science Course in Concentration	3
Science Education Elective	3
	12

SUMMER	
EDS 5081 Research 1	3
Science Course in Concentration	3
Elective	3
	9
TOTAL CREDITS REQUIRED	33

Educational Specialist Degree Program

The primary emphasis of the educational specialist degree is placed on the development of specific competencies needed in science education.

Admission Requirements

The applicant to the educational specialist program must hold a master's degree in science or education with science as the teaching area.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

A candidate for the educational specialist degree must maintain a grade point average of 3.0 or better in a 30-credit-hour program. Although research methodologies are included in the curriculum, no thesis is required. A final examination is given in the last semester of enrollment by a three-member committee appointed by the department head and approved by the Graduate School office. A student can transfer up to 12 hours of graduate credit from other approved institutions offering at least the educational specialist degree.

Curriculum

Candidates for the educational specialist degree must complete 30 credit hours of course work beyond the master's degree as follows:

Current Research and Methodologies in Science Education (9 credit hours)—Must be taken at Florida Tech; exceptions may be considered only through a written petition, reviewed by the department's graduate faculty.
EDS 5070 Educational Statistics 3
EDS 5095 Essentials of Educational Research 3
EDS 5203 Theories and Trends in Education 3

Science (9 credit hours)—The candidate must have earned a minimum of 21 graduate hours in science beyond the bachelor's degree. These hours include the nine specifically required for the specialist degree and any other hours from approved postbaccalaureate science courses.

Science Education (9 credit hours)—As approved by the head of the department.

Electives (3 credit hours)—Each student chooses an elective to fit a particular certification and/or interest area.

Doctoral Degree Programs

The doctor of philosophy (Ph.D.) and doctor of education (Ed.D.) programs are designed to provide increased competence in science, science education and research. Recipients gain the appropriate knowledge and skills for positions in college and university science education programs; teaching, administration and supervisory posts in state and local school systems; positions teaching the science in liberal arts colleges and introductory science courses in universities; and as research directors in science education.

The primary difference between the Ph.D. and Ed.D. programs is in the focus of the dissertation work. The focus of the Ph.D. is typically theoretical, while the focus of the Ed.D. is more applied and intended for the practitioner. While Ph.D. dissertation research is oriented for the student going into a university graduate teaching and research setting, Ed.D. dissertation research is oriented for K–12 school or business/industry practitioners and typically involves a practical field problem.

The two programs also differ in the requirement of two speciality area courses in the Ed.D. These two courses are typically in science education, instructional technology or environmental education, but may also be in mathematics education.

Doctoral students interested in theory-based research should consider the Ph.D. For those more interested in practical field research, the Ed.D. would be more appropriate.

Admission Requirements (both programs)

An applicant to the doctoral program in science education must have a master's degree in a field of science, technology, aeronautics or science education, with a cumulative grade point average of at least 3.2 on a 4.0 scale. At least three years' teaching experience is also highly recommended. An applicant with a major technical area in aeronautics must also have FAA certification and enough practical experience to qualify as a professional in the aviation field.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements (both programs)

A minimum of 48 credit hours beyond the master's degree is required to earn the doctoral degree. These credits include 24 credit hours of dissertation in addition to the required course work.

REQUIRED COURSES	CREDITS
EDS 5070 Educational Statistics	3
EDS 5095 Essentials of Educational Research	3
EDS 5203 Theories and Trends in Education	3
EDS 6070 Statistics for Educational Research	3

These courses must be taken at Florida Tech. Exceptions may be considered only through a written petition, reviewed by the department's graduate faculty.

General degree requirements are presented in the *Graduate Information and Regulations* section of this catalog.

Written comprehensives and oral comprehensives must be taken in the same semester. The doctoral comprehensive examinations are given in the last full week of September and January.

Doctor of Philosophy Curriculum

Major Technical Area—A minimum of 21 credit hours beyond the bachelor's degree must be taken in the student's chosen major technical area. The student may choose from the following major technical areas: aeronautics, biology, chemistry, computer science, engineering, environmental science, oceanography/earth science or physics. These 21 hours may include courses from previous graduate degrees as well as courses taken as part of the Ph.D. program and must include AVM 5101 if the major technical area is aeronautics.

Research—A minimum of 24 credit hours will be devoted to dissertation research, including at least three hours of EDS 6000 (Readings in Educational Research), at least three hours of EDS 6010 (Research Practicum) and at least 18 hours of EDS 6999 (Dissertation).

Doctor of Education Curriculum

Major Technical Area—A minimum of 18 credit hours beyond the bachelor's degree must be taken in the student's chosen major technical area. The student may choose from the following major technical areas: aeronautics, biology, chemistry, computer science, engineering, environmental science, oceanography/earth science or physics. These 18 hours may include courses from previous graduate degrees as well as courses taken as part of the Ed.D. program and must include AVM 5101 if the major technical area is aeronautics.

Specialty Area—A minimum of six credit hours must be taken in science education, instructional technology or environmental education. (Specialty area credits may also be in mathematics education.)

Research—A minimum of 24 credit hours will be devoted to dissertation research, including at least three hours of EDS 6000 (Readings in Educational Research), at least three hours of EDS 6010 (Research Practicum) and at least 18 hours of EDS 6999 (Dissertation).

DEPARTMENT OF PHYSICS AND SPACE SCIENCES
Laszlo Baksay, Ph.D., Head

Space Sciences

Bachelor of Science *Master of Science* *Doctor of Philosophy*
Astronomy and Astrophysics Option

Professors

Laszlo Baksay, Ph.D., *experimental high-energy physics at LHC and LEP/CERN, detector development, maglev.*

Terry D. Oswalt, Ph.D., *stellar spectroscopy and photometry, white dwarf stars, binary stars, stellar acitivity, minor planets and comets.*

Associate Professors

Marc M. Baarmand, Ph.D., *experimental particle physics at Fermi National Accelerator Laboratory and CERN.*

Rong-sheng Jin, Ph.D., *terrestrial geomagnetism, especially changes in the Earth's field with time; correlation with Earth's rotation rate.*

Hamid K. Rassoul, Ph.D., *observation and modeling of magnetic storms and substorms, photochemistry of the earth's upper-atmosphere, solar wind-magnetosphere interactions, upward propagating lightning.*

Matthew A. Wood, Ph.D., *astrophysics, theory and observation of white dwarf stars, cataclysmic variables.*

Ming Zhang, Ph.D., *cosmic radiation and interactions with the plasma and magnetic fields in the interstellar medium, the heliosphere and magnetospheres.*

Assistant Professors

Joseph R. Dwyer, Ph.D., *space physics, solar and heliospheric energetic particle observations, space instrumentation, upward propagating lightning.*

Marcus Hohlman, Ph.D., *particle physics, experimental high-energy physics with L3 and CMS experiments at CERN, development of particle detectors.*

James G. Mantovani, Ph.D., *condensed matter theory and experiment, particularly surface physics and electron microscopy.*

Visiting Assistant Professor

Sandra Clements, Ph.D., *observational astronomy, variability studies of quasars, blazars and other active galactic nuclei.*

Adjunct Professor

Marcelo Alonso, Ph.D.

Professors Emeriti

Joel H. Blatt, Ph.D.; Jay Burns, Ph.D.; J.D. Patterson, Ph.D.

Director of Undergraduate Laboratories

J.A. Gering, M.S.

Bachelor of Science Degree Program

The space sciences undergraduate program is designed for students interested in pursuing space-related careers, either upon graduation or after completing graduate studies in the earth, planetary or space sciences. Emphasis in the curriculum is on achieving a broad but sound education in the basic physical, mathematical and engineering sciences as a foundation for successful entry into any of the many subfields of modern space science activity. Students may gain experience in designing space missions and instrumentation and working on current NASA spacecraft (ACE, Wind and Ulysses). Current research topics include solar energetic particle measurements, x-ray and gamma-ray observations of lightning, cosmic-ray astrophysics, the impact of solar eruptions on the geospace environment, and atmospheric optical and UV observations. (For more details, see "Geospace Physics Laboratory" in the *Research: Institutes, Centers and Major Laboratories* section of this catalog.)

Degree Requirements

Candidates for a Bachelor of Science in Space Sciences must complete the minimum course requirements outlined in the following curricula. The student must select either the Bachelor of Science in Space Sciences or the Bachelor of Science in Space Sciences, Astronomy and Astrophysics option. One or the other, but not both, will be shown on the transcript and diploma.

Because subject matter in general physics and astronomy forms a critically important foundation for all advanced course work in space sciences, the minimum grade for satisfying the prerequisite requirements for a space sciences major is a grade of C for each of the following courses: PHY 1001, PHY 2002, PHY 2003, PHY 2091, PHY 2092; and SPS 1010, SPS 1020.

Freshman Year

FALL		CREDITS
CHM 1101	Chemistry 1	4
COM 1101	Composition and Rhetoric	3
MTH 1001	Calculus 1	4
PHY 1050	Physics and Space Science Seminar	1
SPS 1010	Introduction to Astronomy	3
		15

SPRING		
CHM 1102	Chemistry 2	4
MTH 1002	Calculus 2	4
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
SPS 1020	Introduction to Space Sciences	3
		16

Sophomore Year

FALL		CREDITS
COM 1102	Writing about Literature	3
CSE 15xx	Restricted Elective (Computer Science)	3
MTH 2001	Calculus 3	4
PHY 2002	Physics 2	4
PHY 2092	Physics Lab 2	1
	Free Elective	3
		18

SPRING		
HUM 2051	Civilization 1	3
MTH 2201	Differential Equations/Linear Algebra	4
PHY 2003	Modern Physics	3
PHY 3152	Electronic Measurement Techniques	4
SPS 2010	Observational Astronomy	3
		17

Junior Year

FALL		CREDITS
HUM 2052	Civilization 2	3
PHY 3011	Physical Mechanics	4
PHY 3060	Thermodynamics, Kinetic Theory and Statistical Mechanics	4
SPS 3010	Geophysics	3
SPS 3040	Fundamentals of Remote Sensing	3
or		
MET 4233	Remote Sensing for Meteorology	3
or		
OCN 4704	Remote Sensing for Oceanography	3
		17

SPRING		
COM 2223	Scientific and Technical Communication	3
MTH 3201	Boundary Value Problems	3
PHY 3440	Electromagnetic Theory	3
SPS 4025	Introduction to Space Plasma Physics*	3
or		
SPS 4035	Comparative Planetology*	3
	Humanities Elective	3
		15

Senior Year

FALL		CREDITS
MAE 3061	Fluid Mechanics 1	3
or		
OCE 3020	Fluid Mechanics	3
PHY 4020	Optics	3
PHY 4021	Experiments in Optics	1
SPS 3030	Orbital Mechanics	3
SPS 4010	Astrophysics 1	3
SPS 4200	Senior Seminar 1	1
	Technical Elective or Senior Research	3
		17

SPRING		
SPS 4025	Introduction to Space Plasma Physics*	3
or		
SPS 4035	Comparative Planetology*	3
SPS 4030	Physics of the Atmosphere	3
SPS 4210	Senior Seminar 2	1
	Technical Elective or Senior Research	3
	Social Science Elective	3
	Free Elective	3
		16

TOTAL CREDITS REQUIRED 131

Astronomy and Astrophysics Option

The astronomy and astrophysics option is designed to meet the needs of students intending to pursue graduate education and a career in the astronomical sciences.

Freshman Year

FALL		CREDITS
CHM 1101	Chemistry 1	4
COM 1101	Composition and Rhetoric	3
MTH 1001	Calculus 1	4
PHY 1050	Physics and Space Science Seminar	1
SPS 1010	Introduction to Astronomy	3
		15

SPRING		
CHM 1102	Chemistry 2	4
MTH 1002	Calculus 2	4
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
SPS 1020	Introduction to Space Sciences	3
		16

Sophomore Year

FALL		CREDITS
COM 1102	Writing about Literature	3
CSE 15xx	Restricted Elective (Computer Science)	3
MTH 2001	Calculus 3	4
PHY 2002	Physics 2	4
PHY 2003	Modern Physics 1	3
PHY 2092	Physics Lab 2	1
		18

SPRING

COM	2223	Scientific and Technical Communication 3
HUM	2051	Civilization 1 3
MTH	2201	Differential Equations/Linear Algebra 4
SPS	2010	Observational Astronomy 3
		Free Elective 3
		16

Junior Year

FALL CREDITS

HUM	2052	Civilization 2 3
MTH	3101	Complex Variables 3
PHY	3011	Physical Mechanics 4
PHY	3060	Thermodynamics, Kinetic Theory and Statistical Mechanics 4
SPS	3010	Geophysics 3
		17

SPRING

MTH	3201	Boundary Value Problems 3
PHY	3035	Quantum Mechanics 4
PHY	3440	Electromagnetic Theory 3
SPS	3020	Methods and Instrumentation 3
		Social Science Elective 3
		16

Senior Year

FALL CREDITS

MAE	3061	Fluid Mechanics 1 3
		or
OCE	3020	Fluid Mechanics 3
PHY	4020	Optics 3
PHY	4021	Experiments in Optics 1
SPS	4010	Astrophysics 1 3
SPS	4200	Senior Seminar 1 1
		Technical Elective or Senior Research 3
		Humanities Elective 3
		17

SPRING

SPS	4020	Astrophysics 2 3
SPS	4025	Introduction to Space Plasma Physics* 3
		or
SPS	4035	Comparative Planetology* 3
SPS	4210	Senior Seminar 2 1
		Technical Elective or Senior Research 3
		Free Elective 3
		13

TOTAL CREDITS REQUIRED 128

**Courses taught on an alternate-year basis.*

Master of Science Degree Program

The space sciences graduate program stresses astrophysics, astrodynamics, space and planetary physics, cosmic ray physics, space instrumentation, physics of lightning, solar-terrestrial interrelations, terrestrial geomagnetism and stellar photometry. Graduate study in space sciences at the master's level prepares the graduate for a wide range of scientific and technical responsibilities in industry and government related directly or indirectly to the space program.

Admission Requirements

An applicant for admission should have an bachelor's degree in physics, mathematics, space science or an engineering field, and should submit Graduate Record Examination (GRE) scores from both the General Test and the Subject Test in physics.

General admission requirements and the process of applying are presented in the *Graduate Information and Regulations section* of this catalog.

Curriculum

The graduate program is a continuation of the space sciences undergraduate curriculum at Florida Tech; students who have had a different undergraduate curriculum may have to take senior-level undergraduate courses to make up deficiencies. With the approval of the department, students may be given credit toward the master's degree for up to six semester credit hours of senior-level courses taken as a graduate student. Specialized space sciences senior-level courses commonly taken include astrophysics, planetary geophysics and remote multispectral sensing.

The master of science degree is conferred after satisfactory completion of 33 credit hours of required and elective courses. Twenty-seven hours must be taken from the following core-course requirements:

Mathematics/Computer Science (2 courses)

MTH 5051 Applied Discrete Mathematics
MTH 5201 Math Methods in Science and Engineering 1
MTH 5202 Math Methods in Science and Engineering 2
MTH 5301 Numerical Analysis 1
MTH 5401 Applied Statistical Analysis
CSE 5001 Assembly Language and Organization
CSE 5100 Data Structure and Algorithms

Physics (3 courses)

PHY 5015 Analytical Mechanics 1
PHY 5030 Quantum Mechanics 1
PHY 5031 Quantum Mechanics 2
PHY 5081 Statistical Mechanics
ECE 5410 Electrodynamics 1
ECE 5411 Electrodynamics 2

Space Sciences (4 courses)

SPS 5010 Astrophysics 1: Stellar Structure and Evolution
SPS 5011 Astrophysics 2: Galactic Structure and Cosmology
SPS 5020 Space Physics 1: The Low-Energy Universe
SPS 5030 Planetary Science 1: Interiors
SPS 5031 Planetary Science 2: Atmospheres
SPS 5050 Astrodynamics

Courses taken during undergraduate years and applied to a bachelor's degree or equivalent may not be used to fulfill the core-course requirements. Substitutions may be made in special cases with the approval of the department head.

Electives can be selected with the adviser's approval from a wide variety of space science (SPS), space systems (SPC), physics (PHY), electrical and computer engineering (ECE), mechanical and aerospace engineering (MAE), computer science (CSE) and mathematics (MTH) offerings, including:

ECE 5350 Optical Electronics
ECE 5353 Optical Computing
ECE 5425 Antennas 1
ECE 5426 Antennas 2
PHY 5016 Analytical Mechanics 2
PHY 5020 Optics
PHY 5034 Semiconductor Physics
PHY 5035 Solid State Physics 1
PHY 5036 Solid State Physics 2
PHY 5054 Fourier Optics
PHY 5080 Thermodynamics
SPC 5004 Space Propulsion Systems
SPC 5005 Space Power Systems
SPC 5006 Space Communications and Data Systems
SPC 5017 Aerospace Remote Sensing Systems
SPC 5080 Space Missions

A thesis is optional and up to six semester hours of credit may be allowed for work leading to the thesis.

A general written examination is given by the department twice each year during the spring semester. A graduate student is normally required to take this examination in the second semester of residence. Before the master's degree is granted, the student must pass a final oral examination administered by a committee of three or more members of the graduate faculty selected by the student and the departmental adviser, and including at least one member from outside the department. The examination pertains primarily to areas related to the field of the thesis. If the nonthesis option is chosen, the student is required to pass an oral examination, administered as above, covering the general area of the student's graduate studies.

Doctor of Philosophy Degree Program

The space sciences comprise an interdisciplinary field that includes astronomy, astrophysics, planetary and solar studies. By nature a broad subject, graduate study in the space sciences can be narrowly focused within one of these specializations. Florida Tech's doctoral degree in space sciences provides training with the breadth and depth consistent with the highest level degree. Such training produces qualified professionals for teaching and research in academic institutions and for research and related work in government and industry.

Admission Requirements

Admission to the doctoral program is granted to a limited number of applicants who have successfully completed a master of science in space sciences or a related field, such as astronomy or physics, with a cumulative GPA of 3.3 or higher. A recommendation for doctoral-level study is required, and if the degree is from Florida Tech the recommendation must come from the student's examining committee. Graduate Record Examination (GRE) scores from both the General Test and the Subject Test in physics, three letters of recommendation, a résumé of academic and work experience and a statement of objectives must be provided.

A student enrolled in Florida Tech's master of science program in space sciences may be considered for transfer to the doctoral program upon completion of 15 credit hours after admission to that program, with a cumulative GPA of 3.3 or higher and a passing score on a qualifying examination administered by the department.

A doctoral student whose bachelor's degree is in an area other than space sciences might be required to complete one or more deficiency courses as identified by the department head at the time of admission.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The doctoral degree is conferred primarily to recognize a person who has demonstrated a satisfactory breadth and level of scientific accomplishment and has the ability to investigate scientific problems independently. It is also expected that the successful candidate for the degree will have advanced or played a significant part in the advancement of fundamental knowledge in the space sciences.

Each candidate for the doctoral degree must prepare and carry out a program of study approved by the major adviser and the department head; pass a departmental qualifying examination; pass a written doctoral comprehensive examination, which emphasizes the student's major area of concentration; submit a dissertation proposal that gains the approval of the student's Doctoral Committee; complete a program of significant original research; and write and successfully defend a dissertation based on the program of research.

The Doctor of Philosophy in Space Sciences is by nature a research degree. Dissertation research is normally begun immediately after successful completion of the comprehensive examination by the end of the second year of full-time graduate course work. The comprehensive examination includes both a written and oral evaluation of the candidate's aptitude and preparation for independent research. Dissertation research is closely supervised by the student's adviser. Because of this high level of personal commitment by the adviser, a prospective doctoral candidate must be willing to undertake dissertation research in an area of current active interest by the department's faculty. Prior to the award of the Doctor of Philosophy in Space Sciences, the candidate presents the completed dissertation manuscript and orally presents and defends the research results to the doctoral committee.

The student is also expected to present a seminar on the dissertation research. The dissertation, or a significant portion thereof, must have been accepted for publication in a major refereed journal before the degree can be awarded.

The department does not require candidates for the doctorate to present evidence of competence in a foreign language, but because of the importance of communications with foreign scientists, it is strongly urged that candidates for the doctorate acquire reading competency in at least one language in addition to English. The student is also advised to be proficient with at least one programming language.

Completion of the doctoral program in space sciences requires a minimum of 81 credits beyond the bachelor's degree (or 48 hours beyond the master's) including dissertation credit and at least 24 semester hours of required and elective courses. Course work, including courses that may have been applied toward a master of science degree, must include at least 15 semester hours of core courses, 24 semester hours of foundation courses and 12 semester hours of electives, and must include at least 18 credits taken at Florida Tech. The core courses offered by the department are usually offered every other year; therefore, the student is advised to plan his/her curriculum carefully.

Core Courses (15 credits)

SPS 5010 Astrophysics 1: Stellar Structure and Evolution
SPS 5011 Astrophysics 2: Galactic Structure and Cosmology
SPS 5020 Space Physics 1: The Low-Energy Universe
SPS 5021 Space Physics 2: The High-Energy Universe
SPS 5030 Planetary Science 1: Interiors
SPS 5031 Planetary Science 2: Atmospheres
SPS 5050 Astrodynamics

Foundation Courses (24 credits)

ECE 5410 Electrodynamics 1
ECE 5411 Electrodynamics 2
MTH 5201 Math Methods in Science and Engineering 1

MTH 5202 Math Methods in Science and Engineering 2
MTH 5301 Numerical Analysis
PHY 5015 Analytical Mechanics 1
PHY 5016 Analytical Mechanics 2
PHY 5030 Quantum Mechanics 1
PHY 5031 Quantum Mechanics 2
PHY 5054 Fourier Optics
PHY 5080 Thermodynamics
PHY 5081 Statistical Mechanics

Electives (12 credits)—Electives can be other space sciences courses, or selected courses in mathematics, computer science, electrical engineering or physics. A complete list of approved elective courses is available from the physics and space sciences department. The substitution of electives outside this list is allowed with concurrence of the adviser and the department head.

Many of the core and foundation courses will probably have been taken at the master's level, as well as other courses that would qualify as electives. Therefore, the number of core, foundation and elective credit hours beyond the master's degree could be as low as 24.

Teaching and Research Assistantships

The department offers a number of teaching and research assistantships each year. Teaching assistants participate in laboratory instruction, or in the preparation of teaching materials and the grading of papers. Research assistants work on research projects that are often related to their own master's thesis or doctoral dissertation investigations. Both types of assistantships are awarded on a competitive basis, and provide graduate course fee remission and a stipend for living expenses. To increase the probability of receiving an assistantship, applicants are advised to apply as early as possible in the academic year prior to requested admission.

Research Activities

Graduate students can pursue both theoretical and experimental research in the following fields of specialty, which are active in the department.

Astrophysics

- Gravitational redshifts and evolution of white dwarf stars
- Astronomical image processing
- Photoelectric photometry and theoretical models of close binary systems
- Astrophysical fluid dynamics

Solar Physics and Planetary Science

- Solar corona and interplanetary medium
- Time dependence of geomagnetic field strength, correlation with changes in Earth rotation rate
- Multicolored photometry and occultation studies of minor planets and comets
- Auroral and ionosphere physics, solar particle flux
- Space-based energetic particle observations
- Cosmic-ray propagation modeling

Remote Sensing and Instrumentation

- Moiré profilometry, especially of space structures
- Ground- and space-based IR studies of global atmospheric CO_2 content and other trace gases
- Night sky brightness, light pollution

Other

- Infrared detection by narrow bandgap semiconductors
- Magnetostatic field calculations for travelling wave tubes
- Optical properties of solids
- Experiments in microgravity

Research Facilities

Experimental research in space sciences is carried out in a variety of laboratories operated by the department of physics and space sciences. Facilities that are currently available to graduate students include:

Computational Facilities

The department's facilities include a network of Linus workstations and numerous microcomputers. The Computational Physics Lab, consisting of 12 Pentium PCs capable of running LINUX/X-Windows and MS Windows 95/98, is available to students.

Geospace Physics Laboratory (GPL)

See *Research: Institutes, Centers and Major Laboratories* in this catalog.

Astronomy and Astrophysics Laboratory

This facility offers image processing using IRAF (Image Reduction and Analysis Facility) software for LINUX workstations; applications to astronomical spectra; and image processing. Current research includes CCD spectral line profile analysis of white dwarf stars.

SARA 0.9-M Telescope at Kitt Peak National Observatory

Florida Tech is the administrative institution for the Southeastern Association for Research in Astronomy (SARA). SARA has recommissioned a 0.9-m telescope at Kitt Peak National Observatory near Tucson, Arizona, for CCD imaging and photometry. In addition to conventional on-site use of the telescope, the fully automated telescope may also be remotely accessed via Internet. Approximately one-fourth of all annual observing time on this facility is allocated to Florida Tech faculty and student research projects.

Technical and Professional Communication

Bachelor of Science (See Communication) *Master of Science*

Program Chair
Judith B. Strother, Ph.D.

Associate Professors
Randall L. Alford, Ph.D., *language studies, applied linguistics and grammatical theory.*

Judith B. Strother, Ph.D., *theoretical and applied business, scientific and technical communication, editing, applied linguistics and psycholinguistics.*

Jane T. Tolbert, Ph.D., *journalism, mass communication, scientific and technical communication.*

Assistant Professors
Alan M. Rosiene, Ph.D., *rhetorical theory, history of literary theory, deconstruction, cultural studies, freshman composition.*

Carol M.H. Shehadeh, M.A., *Internet publishing, business/technical writing and editing, documentation, instructional technology.*

Master of Science Degree Program

The master of science program in technical and professional communication stresses the development of practical, career-oriented written, oral and analytical skills necessary for success in business, industry, management and in a wide variety of technical and professional contexts. The degree program combines theory and document analysis with practice in

- generating written documents in a wide variety of forms and styles—from research-based papers and academic articles to formal reports and proposals;
- revising and editing technical, scientific and managerial documents for a variety of professional purposes;
- constructing and delivering business and technical presentations;
- designing and publishing professional-quality documents; and
- problem solving and communication-oriented decision making in collaborative team environments.

Admission Requirements

An applicant should have a bachelor's degree (B.A., B.S. or B.B.A.) prior to admission. Because of the interdisciplinary nature of this graduate program, students with undergraduate degrees in a wide variety of fields (e.g., biological sciences, business, communication, computer science, engineering, English, journalism, management, psychology, and physical and social sciences) are encouraged to apply.

Applicants should submit 1) official transcripts of all undergraduate and graduate work undertaken previously; 2) two letters of recommendation from academic or professional sources; 3) GRE Verbal and Analytical test scores totaling at least 1,000; and 4) a discursive writing sample (e.g., an academic research or critical paper, professional proposal, manual, or business or technical report).

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The program consists of 36 credit hours of approved graduate course work, including both required courses and electives tailored to meet the student's professional needs. Students are required to enroll in 15 hours of core courses, 12 hours of advanced course work in technical and professional communication, and six hours of elective courses to complement and broaden their professional skills. To complete the program, a student either produces and defends a design project or thesis, or takes an additional three hours of course work.

Curriculum

The core curriculum includes course work in the following areas: 1) research and methods of analysis in technical and professional communication; 2) technical, scientific and managerial discourse; 3) technical editing, document design and software documentation; 4) rhetorical analysis and style study; and 5) language theory.

The core curriculum is enriched with elective course work. Master's students are encouraged to select elective sequences to pursue areas of particular research or professional interest.

Core Courses (15 credit hours)

COM 5000 Introduction to Technical and Professional Communication 3
COM 5050 Theories of Human Communication 3
COM 5102 Research Methods and Materials in Technical and Professional Communication 3
COM 5249 Document Design 3
COM 5345 Communicating in the Global Economy 3

Advanced Courses (12 credit hours)

At least four of the following courses

COM 5002 Writing for Specific Purposes 3
COM 5144 Science Journalism 3
COM 5247 Technical Editing 3
COM 5251 Oral Presentation for Business and Technical Audiences 3
COM 5252 Seminar in Marketing Communication 3
COM 5253 Customer Service and Communication 3
COM 5353 Advanced Managerial Report Writing 3
COM 5355 Seminar: Special Topics in Technical and Professional Communication 3
COM 5400 Independent Study 3
COM 5565 Technical and Professional Communication Internship 3–6
COM 5777 Technical and Professional Communication Design Project 3–6
COM 5999 Technical and Professional Communication Thesis 3
HUM 5020 The Roots of Rhetoric: Classical and Historical Perspectives 3
HUM 5021 Contemporary Rhetoric and Discourse Theory 3
LNG 5210 Aspects of Language 3

Electives (6 credit hours)

In addition, six credit hours of elective course work must be selected by students in the master's program. Students can pick up a copy of suggested electives from the program chair.

Nonthesis Option

A student may choose to complete 36 hours of course work without completing a thesis or design project. In that case, the student must take a final program examination no earlier than the last full semester in which the student is registered for courses.

Thesis/Design Project

In lieu of three hours of course work, the student may choose to complete either a traditional, research-based thesis or a design project (an extended problem-solving project exploring and resolving a designated situation in business, industry, government or education).

A thesis or design project proposal must be approved in advance by the student's committee. A defense of the thesis or the design project before the student's faculty committee is required. A unanimous vote of the student's committee is necessary for acceptance of the thesis or design project.

School of Aeronautics

Dean Michael K. Karim, Ph.D.

Bachelor of Science

Aeronautical Science
Aeronautical Science Flight Option
Aviation Computer Science
Aviation Management
Aviation Management Flight Option
Aviation Meteorology
Aviation Meteorology Flight Option

Master of Science in Aviation

Airport Development and Management
Applied Aviation Safety

Master of Science

Aviation Human Factors

Associate Dean and Director, Center for Airport Management and Development
Ballard M. Barker, Ph.D.

Director, Division of Aviation Studies
Kenneth E. Crooks, J.D.

Program Chair, Aeronautical Science
John H. Cain, Ph.D.

Program Chair, Aviation Management
William R. Graves, M.B.A.

Program Chair, Graduate Studies
Nathaniel E. Villaire, Ed.D.

Associate Professors
Ballard M. Barker, Ph.D., *aviation systems management, aviation facility planning, aerial remote sensing applications.*

William M. Chepolis, D.Eng., *aerodynamics, aviation computer applications, avionics.*

John E. Deaton, Ph.D., *aviation human factors, applied aviation psychology.*

Ronald W. Hansrote, M.D., *aviation medicine, physiology, aeronautics, accident investigation.*

Michael K. Karim, Ph.D., *instructional technology systems, distance learning, project management.*

Tom Utley, Ph.D., *meteorology, environmental science.*

Nathaniel E. Villaire, Ed.D., *aviation safety, aviation physiology, airspace management, air traffic control.*

Assistant Professors
John H. Cain, Ph.D., *aeronautical science and technology applications, accident investigation, modern aircraft systems, flight deck avionics.*

Kenneth E. Crooks, J.D., *aviation law, labor relations, legal and ethical issues in aviation management.*

Paul B. Davis, M.B.A., *international business, crew resource management, multimodal transportation.*

William R. Graves, M.B.A., *aviation planning, airport design, aerodynamics, aviation computer applications, CAD for airports.*

Robert T. Schuster, M.A.S., *flight operations, turbine transition.*

David W. Smith, M.S., *airline operations, aviation education, air transportation management.*

Professors Emeriti
Alan L. Devereaux, M.B.A.; Edmund B. Everette, M.B.A.; N. Thomas Stephens, Ph.D.

Adjunct Professor
J.E. Faulk, J.D.

Lecturers
E. Lindner, M.B.A.; W.W. Lowell, M.S.

Organization

The seven baccalaureate degree programs of the School of Aeronautics include aviation management, aeronautical science and aviation meteorology curricula, each with flight and nonflight options, and aviation computer science. The aviation management, aeronautical science and aviation computer science programs are fully accredited by the Council on Aviation Accreditation. The school offers a Master of Science in Aviation with options in airport development and management, and applied aviation safety; and a Master of Science in Aviation Human Factors.

Pilot training is an integral part of each flight option, and academic credit is awarded accordingly. Pilot training is conducted in conjunction with the normal academic programs, either as required or elective courses.

The School of Aeronautics is a member of the University Aviation Association and the Council on Aviation Accreditation. The school is recognized as a Federal Aviation Administration Airway Science Institution and an Aviation Education Resource Center. University flight training is conducted under the provisions of Federal Aviation Regulations Part 141.

Four aviation organizations for students are sponsored by the School of Aeronautics: Alpha Eta Rho, the national aviation fraternity; Women in Aviation International; the International Society of Air Safety Investigators and the Falcons Intercollegiate Flight Team.

Facilities

The School of Aeronautics faculty and administrative offices, laboratories and academic classrooms are located in George M. Skurla Hall, at the corner of University Boulevard and Country Club Road on Florida Tech's main campus. Flight training is conducted by F.I.T. Aviation L.L.C., a subsidiary of the university that maintains and operates a fleet of approximately 35 single- and multiengine training aircraft at nearby Melbourne International Airport. This towered airport hosts a mix of air carrier and general aviation traffic on its three runways, and with five separate terminal navigation facilities, an instrument landing system and a radar approach control, it provides an excellent environment for professional flight training. Superb Florida weather, allowing efficiency of scheduling and continuity of training, adds to the training

experience. The many general aviation and commercial service airports in Central Florida also offer diversity and alternatives for flight training.

Admission

As a Freshman

A new freshman applicant is expected to have completed a high school college-preparatory curriculum, including mathematics courses—algebra, geometry and trigonometry. Applicants are evaluated on the basis of SAT/ACT scores, high school grade point averages, class standing and grades in foundation courses such as English, science and mathematics.

Tests administered to all entering freshmen during the week preceding the start of classes each semester determine appropriate placement in mathematics. Entering freshmen with previous flight training and at least the FAA Private Pilot Certificate will also be given the opportunity for advanced placement. Credit for certain flight and ground courses may be given for attainment of satisfactory scores on designated equivalency examinations and by logbook review and flight evaluation.

Students seeking admission to flight training must be examined by an FAA-designated aviation medical examiner and have an FAA medical certificate and student pilot certificate prior to the start of flight training. Applicants intending to seek a Commercial Pilot Certificate must have 20/20 vision in each eye, with or without correction. Medical examinations should be done far enough in advance of university admission to allow any potential problems or questions to be resolved.

As a Transfer Student

The School of Aeronautics welcomes transfer students from other colleges, and every effort is made to transfer the maximum number of credits. Transfer students may receive college credit for previous flight and ground training at the discretion of the division director. Transfer credit for flight training is normally granted only when the student is first enrolled, and after an evaluation, which may include a flight evaluation.

Dismissals

Dismissal policies for academic programs of the School of Aeronautics are the same as those stated in the *Undergraduate Information and Regulations* section of this catalog. However, due to the high-performance standards required for safety in flying, an added degree of commitment to meet those standards is required of the student pilot undergoing flight training. The dean of the School of Aeronautics retains the right to place on probation, suspend or administratively withdraw, any flight student from any university flight training course if such action is judged to be warranted by the student's behavior.

Flight Programs

Flight courses for academic credit are available to all interested Florida Tech students. Prospective students interested in any university flight training should be aware of weight and height limitations that may hinder or preclude safe and effective training. Training aircraft and many other aircraft in general use cannot accommodate persons with heights of less than 60 inches or greater than 77 inches, or body weights greater than 260 pounds (220 pounds for aerobatic training aircraft, which may be required for Flight Instructor training). Prospective students who may be affected by these limitations should make their situation known to admissions and the School of Aeronautics representatives at the earliest point in the application process for a case-by-case enrollment evaluation.

A summer program is offered to prospective students who have not yet started their flight training. This program gives high school graduates an opportunity to become acquainted with the flight environment by participating in an intensive two-month ground and flight training course. A student who is successful in the program will earn a Private Pilot Certificate and may enter the fall semester with advance credit for Flight 1 and Aeronautics 1 (a total of five semester credit hours). The credit will be applicable to all degrees offered by the School of Aeronautics, and may be used as elective credit in many other Florida Tech degree programs.

Professional, vocational, and recreational flight training are also provided by arrangement at the aviation center, and qualified pilots may rent university aircraft. The aviation center offers training for FAA certificates for private, commercial and instructor pilot certificates, as well as training for the FAA ratings for instruments, multiengine, instrument instructor and multiengine instructor. An aerobatics course is also offered.

Degree Requirements

Candidates for School of Aeronautics degree programs must complete the minimum course requirements as outlined in the appropriate curriculum. Deviation from the recommended program may be made only with the approval of the division director or dean.

Flight Training Program

The flight training sequence for the aviation management flight option consists of four courses, AVF 1001 through AVF 2002, plus four additional flight credits, at least two credits of which must be earned in a multiengine course. This program is an integrated series of courses designed to qualify the student at the end of the first two academic years for the commercial pilot certificate and an instrument rating with a minimum of 190 hours of flight training. The aeronautical science flight option requires three upper-division flight courses in addition to the four-course lower division sequence. Students enrolled in the School of Aeronautics may not normally take flight training for credit outside the university's program.

A student seeking an FAA certificate or rating through the School of Aeronautics must complete courses pertinent to the desired certification at the university. To comply with FAA requirements, specific grades and attendance standards must be met in the following ground courses: AVT 1111 (Aeronautics 1), AVT 1112 (Aeronautics 2), AVT 2111 (Aeronautics 3) and AVT 3101 (Instructional Techniques). FAA knowledge test fees are in addition to normal course fees.

Additional flight and ground training "add time" may be required for students not making satisfactory progress or having specific areas requiring extra training to achieve certification. Costs for all such "add time" will be in addition to regular course fees.

Safety is a preeminent concern of the School of Aeronautics. All aircraft are modern, well equipped and maintained to the highest standards required by the FAA. Instructors and staff are particularly safety conscious and will insist students be physically and mentally fit to fly. All flight students are subject to random or "for cause" drug testing during enrollment as flight students. Any confirmed use of illegal drugs or chronic abuse of alcohol is cause for immediate dismissal from all flight training programs. Insurance coverage is automatically provided for all students operating aircraft under the university program.

All flight students seeking bachelor's degrees, regardless of experience or certificates, are required to take at least four credit hours of upper-division flight courses through the School of Aeronautics in addition to other degree requirements. Two of the upper-division credits must be in a multiengine flight course. All students applying for associate degrees in a flight option must have completed at least one two-credit flight course through the School of Aeronautics.

Aviation Management Internship Program

A six-credit aviation management internship program (AMIP) is offered to eligible senior students. The program consists of two courses, AVM 4600 and AVM 4603. This highly successful and popular program involves placement of students in entry-level management positions for a semester with air transportation, air commerce, aviation consulting, airport and governmental organizations throughout the United States and in selected foreign locations.

A management intern performs a variety of aviation management tasks under the supervision of working professionals, submits a series of graded written reports and presents a formal and written final report to selected students and faculty following the internship assignment.

To be eligible, a student must have completed all major requirements for the first three years of the curriculum, have a cumulative grade point average of at least 2.8 and be approved by a faculty committee.

Students enrolling in AMIP must have one full semester or summer session remaining after completion of AMIP. As a consequence, most students will enroll in AMIP during their last summer or the first semester of their senior year. The decision to enroll in AMIP must therefore be made and formalized with the student's adviser no later than early in the second semester of the junior year. Students planning to substitute AMIP credits for elective credit should make this decision early in their programs.

Electives

Electives are included to give the student reasonable flexibility and diversity within the constraints of total curriculum length and requirements of various accrediting and certification agencies.

Elective flight courses include all instructor ratings, advanced instrument proficiency, air-taxi training and aerobatics.

Nonflight-option students are encouraged to enroll in appropriate flight courses for personal and professional enhancement using elective credit.

Six credits of aviation management internship may be substituted for any free or AVx/BUS electives.

Aviation Management Flight Option

Bachelor of Science

This curriculum prepares the student to become a professional pilot with a strong business and management foundation appropriate for careers in air commerce, airport management and aircraft sales and insurance. After completing the first two years of the curriculum, as listed below, with a cumulative GPA of 2.0 or higher, a student may petition for the award of the Associate of Science in Aviation Management Flight Option degree.

Freshman Year

FALL		CREDITS
AVF 1001	Flight 1	2
AVS 1201	Aviation Meteorology	3
AVT 1111	Aeronautics 1	3
COM 1101	Composition and Rhetoric	3
MTH 1000	Pre-Calculus	3
		14

Private Pilot Written Examination
Private Pilot Flight Test

SPRING		
AVF 1002	Flight 2	2
AVS 1101	Aviation Chemical Science	3
AVT 1112	Aeronautics 2	3
BUS 1301	Basic Economics	3
COM 1102	Writing about Literature	3
MTH 1603	Applied Calculus and Statistics	3
		17

Sophomore Year

FALL		CREDITS
AVF 2001	Flight 3	2
AVS 2101	Aviation Physical Science	3
AVT 2111	Aeronautics 3	3
BUS 2211	Introduction to Financial Accounting	3
CSE 1301	Introduction to Computer Applications	3
HUM 2051	Civilization 1	3
		17

Commercial Pilot Written Examination
Instrument Pilot Written Examination
Instrument Pilot Flight Test

SPRING		
AVF 2002	Flight 4	2
AVS 2102	Aerodynamics	3
AVS 2222	Aviation Physiology	3
BUS 2212	Introduction to Managerial Accounting	3
HUM 2052	Civilization 2	3
PSY 1411	Introduction to Psychology	3
		17

Commercial Pilot Flight Test

Junior Year

FALL		CREDITS
AVF 4001	Multiengine Pilot	2
AVM 3201	Aviation Planning	3
AVT 3101	Instructional Techniques	3
BUS 3401	Corporate Finance	3
BUS 3501	Management Principles	3
COM 3070	Professional Communication for Executives	3
		17
	Multiengine Pilot Flight Test	
SPRING		
AVM 3202	Airport Design	3
AVM 3302	Multimodal Transportation	3
BUS 2601	Legal and Social Environments of Business	3
BUS 3601	Marketing Principles	3
	Humanities Elective	3
		15

Senior Year

FALL		CREDITS
AVF xxxx	Restricted Elective (Flight)	2
AVM 4201	Aviation Advanced Computer Applications	3
AVM 4301	Aviation Labor Law and Employment Standards	3
AVM 4501	Air Transportation Management	3
AVT 4201	Advanced Aircraft Systems	3
AVT 4301	Aviation Safety	3
		17
SPRING		
AVM 4302	Aviation Law	3
AVM 4701	Airport Management	3
AVT 4202	Advanced Aircraft Operations	3
BUS 3502	Human Relations in Management	3
	Free Elective	3
		15

TOTAL CREDITS REQUIRED 129

Aviation Management

Bachelor of Science

This program provides a comprehensive background in aviation studies, management and business, which is appropriate to careers in air transportation, air commerce, airport planning and management, and aircraft sales and insurance. An elective in this curriculum allows the student to take flight training for credit.

Freshman Year

FALL		CREDITS
AVS 1201	Aviation Meteorology	3
AVT 1111	Aeronautics 1	3
COM 1101	Composition and Rhetoric	3
CSE 1301	Introduction to Computer Applications	3
MTH 1000	Pre-Calculus	3
		15
SPRING		
AVS 1101	Aviation Chemical Science	3
AVT 2201	National Airspace System	3
COM 1102	Writing about Literature	3
MTH 1702	Applied Calculus	3
PSY 1411	Introduction to Psychology	3
		15

Sophomore Year

FALL		CREDITS
AVS 2101	Aviation Physical Science	3
BUS 2211	Introduction to Financial Accounting	3
BUS 2303	Macroeconomics	3
COM 2224	Business and Professional Writing	3
HUM 2051	Civilization 1	3
		15
SPRING		
BUS 2212	Introduction to Managerial Accounting	3
BUS 2304	Microeconomics	3
BUS 2601	Legal and Social Environments of Business	3
BUS 2703	Business Statistics	3
HUM 2052	Civilization 2	3
		15

Junior Year

FALL		CREDITS
AVM 3201	Aviation Planning	3
BUS 3401	Corporate Finance	3
BUS 3501	Management Principles	3
BUS 3601	Marketing Principles	3
COM 3070	Professional Communication for Executives	3
	Humanities Elective	3
		18
SPRING		
AVM 3202	Airport Design	3
AVM 3302	Multimodal Transportation	3
BUS 3503	Human Resource Management	3
BUS 3504	Management Information Systems	3
	Restricted Elective (AVx or BUS)	3
		15

Senior Year

FALL		CREDITS
AVM 4201	Aviation Advanced Computer Applications	3
AVM 4301	Aviation Labor Law and Employment Standards	3
AVM 4401	International Air Commerce	3
AVM 4501	Air Transportation Management	3
AVT 4301	Aviation Safety	3
	Restricted Elective (AVx or BUS)	3
		18
SPRING		
AVM 4204	CAD for Airport Environments	3
AVM 4302	Aviation Law	3
AVM 4502	Aviation Business Simulation	3
AVM 4701	Airport Management	3
BUS 4502	Organizational Behavior and Theory	3
		15

TOTAL CREDITS REQUIRED 126

Aviation Computer Science

Bachelor of Science

This curriculum provides a strong background in computer science as related to several facets of the aviation industry, such as aircraft systems development, air traffic control, airspace management, information support systems and aviation planning. Program content complies with standards of the FAA Airway Science Program.

Freshman Year

FALL		CREDITS
AVS	1201 Aviation Meteorology	3
AVT	1111 Aeronautics 1	3
COM	1101 Composition and Rhetoric	3
CSE	1001 Fundamentals of Software Development 1	4
MTH	1001 Calculus 1	4
		17

SPRING		
COM	1102 Writing about Literature	3
CSE	1002 Fundamental of Software Development 2	4
MTH	1002 Calculus 2	4
PHY	1001 Physics 1	4
PHY	2091 Physics Lab 1	1
		16

Sophomore Year

FALL		CREDITS
CSE	2010 Algorithms and Data Structures	4
HUM	2051 Civilization 1	3
MTH	2051 Discrete Mathematics	3
PHY	2002 Physics 2	4
PSY	1411 Introduction to Psychology	3
		17

SPRING		
AVT	2201 National Airspace System	3
COM	2223 Scientific and Technical Communication	3
CSE	2050 Programming in a Second Language	3
CSE	2410 Introduction to Software Engineering	3
HUM	2052 Civilization 2	3
		15

Junior Year

FALL		CREDITS
AVM	3201 Aviation Planning	3
AVT	3203 Air Traffic Control 1	3
BUS	3501 Management Principles	3
CSE	3101 Machine and Assembly Language	3
CSE	4250 Programming Language Concepts	3
MTH	2401 Probability and Statistics	3
		18

SPRING		
AVM	3202 Airport Design	3
COM	3070 Professional Communication for Executives	3
CSE	4232 Computer Network Programming	3
	Restricted Elective (AVx, BUS, CSE)	3
	Humanities Elective	3
		15

Senior Year

FALL		CREDITS
AVM	4201 Aviation Advanced Computer Applications	3
AVT	4301 Aviation Safety	3
CSE	4001 Operating Systems Concepts	3
	Free Elective	3
	Restricted Elective (CSE)	3
		15

SPRING		
AVM	4204CAD for Airport Environments	3
AVM	4302 Aviation Law	3
AVM	4501 Air Transportation Management	3
	or	
AVM	4701 Airport Management	3
BUS	3502 Human Relations in Management	3
	Restricted Elective (CSE)	3
		15

TOTAL CREDITS REQUIRED 128

Aeronautical Science Flight Option

Bachelor of Science

This curriculum prepares the graduate for a flight operations career in the global aviation science and technology industry and government regulatory agencies. The graduate is provided a strong foundation in mathematics, physics, aeronautical sciences, aeronautical technology, flight training and certification, and the regulated international aviation industry. On completion of the first two years of the curriculum with a cumulative GPA of 2.0 or higher, the student may petition for the award of the Associate of Science, Aeronautical Science Flight Option degree.

Freshman Year

FALL		CREDITS
AVF	1001 Flight 1	2
AVS	1201 Aviation Meteorology	3
AVT	1111 Aeronautics 1	3
COM	1101 Composition and Rhetoric	3
MTH	1001 Calculus 1	4
		15

Private Pilot Written Examination
Private Pilot Flight Test

SPRING		
AVF	1002 Flight 2	2
AVS	1101 Aviation Chemical Science	3
AVT	1112 Aeronautics 2	3
COM	1102 Writing about Literature	3
CSE	1301 Introduction to Computer Applications	3
MTH	1002 Calculus 2	4
		18

Instrument Rating Written Exam

Sophomore Year

FALL		CREDITS
AVF	2001 Flight 3	2
AVS	2222 Aviation Physiology	3
AVT	2111 Aeronautics 3	3
HUM	2051 Civilization 1	3
PHY	1001 Physics 1	4
PHY	2091 Physics Lab 1	1
		16

Commercial Pilot Written Examination
Instrument Rating Flight Test

SPRING

AVF	2002	Flight 4 2
AVS	2102	Aerodynamics 3
HUM	2052	Civilization 2 3
PHY	2002	Physics 2 4
PHY	2092	Physics Lab 2 1
PSY	1411	Introduction to Psychology 3
		16

Commercial Pilot Flight Test

Junior Year

FALL CREDITS

AVF	4001	Multiengine Pilot 2
AVM	2401	Aviation Fiscal Management 3
AVM	3201	Aviation Planning 3
AVT	3101	Instructional Techniques (or restricted elective) 3
MTH	2401	Probability and Statistics 3
		14

Multiengine Pilot Flight Test

SPRING

AHF	3101	Introduction to Human Factors 3
AVF	xxxx	Restricted Elective (Flight) 2
AVM	3202	Airport Design 3
AVS	3201	Aviation Meteorology 2 3
AVT	3203	Air Traffic Control 1 3
		Humanities Elective 3
		17

Senior Year

FALL CREDITS

AVF	xxxx	Restricted Elective (Flight) 2
AVM	4301	Aviation Labor Law and Employment Standards 3
AVT	4201	Advanced Aircraft Systems 3
AVT	4301	Aviation Safety 3
COM	3070	Professional Communications for Executives 3
		Restricted Elective (Aviation) 2
		16

SPRING

AVM	4302	Aviation Law 3
AVM	4501	Air Transport Management 3
AVT	4202	Advanced Aircraft Operations 3
AVT	4203	Airline Operations 3
		Free Elective 3
		15

TOTAL CREDITS REQUIRED 127

Aeronautical Science

Bachelor of Science

This curriculum prepares the graduate for a career in the global aviation science and technology industry and government regulatory agencies. The graduate is provided a strong foundation in mathematics, physics, aeronautical sciences, aeronautical technology and the regulated international aviation industry.

Freshman Year

FALL CREDITS

AVS	1201	Aviation Meteorology 3
AVT	1111	Aeronautics 1 3
COM	1101	Composition and Rhetoric 3
CSE	1301	Introduction to Computer Applications 3
MTH	1001	Calculus 1 4
		16

SPRING

COM	1102	Writing about Literature 3
MTH	1002	Calculus 2 4
PHY	1001	Physics 1 4
PHY	2091	Physics Lab 1 1
PSY	1411	Introduction to Psychology 3
		15

Sophomore Year

FALL CREDITS

AVS	1101	Aviation Chemical Science 3
AVS	2222	Aviation Physiology 3
BUS	1301	Basic Economics 3
HUM	2051	Civilization 1 3
PHY	2002	Physics 2 4
PHY	2092	Physics Lab 2 1
		17

SPRING

AVS	2102	Aerodynamics 3
AVT	2201	National Airspace System 3
COM	2223	Scientific and Technical Communication 3
HUM	2052	Civilization 2 3
MTH	2401	Probability and Statistics 3
		15

Junior Year

FALL CREDITS

AVM	2401	Aviation Fiscal Management 3
AVM	3201	Aviation Planning 3
BUS	2601	Legal and Social Environments of Business 3
BUS	3501	Management Principles 3
COM	3070	Professional Communication for Executives 3
		Humanities Elective 3
		18

SPRING

AHF	3101	Introduction to Human Factors 3
AVM	3202	Airport Design 3
AVM	3302	Multimodal Transportation 3
AVS	3201	Meteorology 2 3
AVT	3203	Air Traffic Control 1 3
		Restricted Elective (Adviser Approval) 3
		18

Senior Year

FALL CREDITS

AVM	4201	Aviation Advanced Computer Applications 3
AVM	4301	Aviation Labor Law and Employment Standards 3
AVM	4501	Air Transportation Management 3
AVT	4301	Aviation Safety 3
		Free Elective 3
		15

SPRING

AVM	4302	Aviation Law 3
AVM	4502	Aviation Business Simulation 3
AVM	4701	Airport Management 3
BUS	4502	Organizational Behavior and Theory 3
		Free Elective 3
		15

TOTAL CREDITS REQUIRED 129

Aviation Meteorology

Bachelor of Science

This program provides a background in meteorology, aeronautical science and appropriate physical sciences. A student completing the program meets the requirements of the U.S. Office of Personnel Management for employment by the federal government as a meteorologist. Graduates are prepared for careers with major airlines, corporate aviation and the FAA, as well as international organizations. B.S. and M.S. degrees in meteorology are also offered as options in the environmental sciences program in the College of Engineering.

Freshman Year

FALL		CREDITS
AVS 1201	Aviation Meteorology	3
AVT 1111	Aeronautics 1	3
COM 1101	Composition and Rhetoric	3
CSE 1301	Introduction to Computer Applications	3
MTH 1001	Calculus 1	4
		16

SPRING		
AVS 1101	Aviation Chemical Science	3
AVT 2201	National Airspace Systems	3
COM 1102	Writing About Literature	3
MTH 1002	Calculus 2	4
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
		18

Sophomore Year

FALL		CREDITS
HUM 2051	Civilization 1	3
MTH 2001	Calculus 3	4
MTH 2401	Probability and Statistics	3
PHY 2002	Physics 2	4
PHY 2092	Physics Lab 2	1
		15

SPRING		
AVS 2102	Aerodynamics	3
COM 2223	Scientific and Technical Communication	3
HUM 2052	Civilization 2	3
MTH 2201	Differential Equations/Linear Algebra	4
OCN 2407	Meteorology	3
		16

Junior Year

FALL		CREDITS
AVT 3203	Air Traffic Control	3
MET 3401	Synoptic Meteorology 1	3
OCN 3430	Fundamentals of Geophysical Fluids	3
PHY 3060	Thermodynamics	4
	Humanities Elective	3
		16

SPRING		
AVS 2222	Aviation Physiology	3
AVS 3201	Aviation Meteorology 2	3
MET 3402	Synoptic Meteorology 2	3
	Aviation Elective	3
	Restricted Elective (Adviser Approved)	3
		15

Senior Year

FALL		CREDITS
AVM 4501	Air Transportation Management	3
AVT 4301	Aviation Safety	3
MET 4305	Atmospheric Dynamics 1	3
	Social Science Elective	3
	Technical Elective	3
		15

SPRING		
AVM 4302	Aviation Law	3
MET 4233	Remote Sensing for Meteorology	3
MET 4306	Atmospheric Dynamics 2	3
MET 4310	Climatology	3
SPS 4030	Physics of the Atmosphere	3
		15

TOTAL CREDITS REQUIRED 126

Aviation Meteorology Flight Option

Bachelor of Science

This program prepares the student for a career as a professional pilot with a strong meteorological and physical science background. A student completing the program also meets the requirements of the U.S. Office of Personnel Management for employment by the federal government as a meteorologist. Students are afforded significant flexibility in career choices upon graduation. On completion of the first two years of the curriculum and satisfaction of the associate degree core requirements, with a cumulative grade point average of 2.0 or higher, the student may petition for the award of the Associate of Science in Aviation Meteorology Flight Option degree.

Freshman Year

FALL		CREDITS
AVF 1001	Flight 1	2
AVS 1201	Aviation Meteorology	3
AVT 1111	Aeronautics 1	3
COM 1101	Composition and Rhetoric	3
MTH 1001	Calculus 1	4
		15

Private Pilot Written Exam
Private Pilot Flight Test

SPRING		
AVF 1002	Flight 2	2
AVT 1112	Aeronautics 2	3
COM 1102	Writing About Literature	3
MTH 1002	Calculus 2	4
PHY 1001	Physics 1	4
PHY 2091	Physics Lab 1	1
		17

Instrument Rating Written Exam

Sophomore Year

FALL		CREDITS
AVF 2001	Flight 3	2
AVT 2111	Aeronautics 3	3
CSE 1301	Introduction to Computer Applications	3
MTH 2001	Calculus 3	4
PHY 2002	Physics 2	4
PHY 2092	Physics Lab 2	1
		17

Instrument Rating Flight Test
Commercial Pilot Written Exam

SPRING

AVF	2002	Flight 4 2
AVS	1101	Aviation Chemical Science 3
AVS	2102	Aerodynamics 3
MTH	2201	Differential Equations/Linear Algebra 4
OCN	2407	Meteorology 3
		15

Commercial Pilot Flight Test

Junior Year

FALL		CREDITS
COM	2223	Scientific and Technical Communication 3
HUM	2051	Civilization 1 3
MET	3401	Synoptic Meteorology 1 3
OCN	3430	Fundamentals of Geophysical Fluids 3
PHY	3060	Thermodynamics, Kinetic Theory and Statistical Mechanics 4
		16

SPRING

AVF	xxxx	Restricted Elective (Flight) 2
AVS	2222	Aviation Physiology 3
AVS	3201	Aviation Meteorology 2 3
HUM	2052	Civilization 2 3
MET	3402	Synoptic Meteorology 2 3
MTH	2401	Probability and Statistics 3
		17

Senior Year

FALL		CREDITS
AVF	4001	Multiengine Pilot 2
AVT	4201	Advanced Aircraft Systems 3
AVT	4301	Aviation Safety 3
MET	4305	Atmospheric Dynamics 1 3
		Humanities Elective 3
		Social Science Elective 3
		17

Multiengine Pilot Flight Test

SPRING

AVM	4302	Aviation Law 3
AVT	4202	Advanced Aircraft Operations 3
MET	4233	Remote Sensing for Meteorology 3
MET	4306	Atmospheric Dynamics 2 3
SPS	4030	Physics of the Atmosphere 3
		15

TOTAL CREDITS REQUIRED 129

Aviation

Master of Science in Aviation (M.S.A.)
Options in:
Airport Development and Management
Applied Aviation Safety

The Master of Science in Aviation (M.S.A.) is designed to help meet the professional growth needs of persons interested in a wide range of aviation careers.

The degree is especially relevant for those who have earned baccalaureate degrees in aviation and those who have worked in the aviation field and now require more specialized knowledge. Generally, persons interested in careers in airport or airline management, airport consulting and governmental organizations involved in the management or regulation of airports should select the airport development and management option. Persons interested in aviation safety, accident investigation, technical aviation consulting and educational, regulatory or investigative positions in government or trade organizations would find the applied aviation safety option most appropriate.

Admission Requirements

The applicant to the Master of Science in Aviation program must have earned a bachelor's degree, or its equivalent, from an institution of acceptable academic standing. To be considered for admission, the student's academic and professional record must indicate that there is a high probability the applicant will be able to pursue graduate work satisfactorily. Undergraduate degrees need not be in aviation; however, preparatory course work may be required in specific areas to assure successful pursuit of the M.S.A. degree. Such course work is determined by the School of Aeronautics prior to admission. The student is advised of any such requirements prior to final acceptance.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The M.S.A. degree is conferred upon students who complete 33 (airport development and management option) or 37 (applied aviation safety option) graduate credits as listed on the student's approved Graduate Program Plan, in conformity with one of the curricula listed below. Each curriculum includes six credits of Thesis (AVM 5999, Aviation Issue Analysis). A non-thesis option is available for the airport development and management curriculum. The non-thesis option adds three credit hours for an aviation research project, and six hours of electives are completed in lieu of the thesis.

Curriculum

Airport Development and Management Option

The adviser assists the student in devising a program of study. Each student must complete a Graduate Program Plan (GPP) with a declared area of concentration by the end of the first semester of enrollment. The resulting GPP requires the approval of both the graduate program chair and the division director. Each student must complete and defend an appropriate thesis or take a total of 36 credit hours including AVM 5998 (Advanced Aviation Research Project), and a program examination. Thesis defense and examination policy and procedures are covered in the Graduate Policies of the School of Aeronautics.

Summary of Program Requirements

AVM	5101	Legal and Ethical Issues in Aviation 3
AVM	5102	Airport Development 3
AVM	5103	Airport Operations 3
		Additional Course Work (minimum) 15
		Graduate Statistics (Restricted Elective) 3
		Thesis (maximum). 6
		TOTAL CREDITS REQUIRED 33

Typical Graduate Program Plan

AVM	5101	Legal and Ethical Issues in Aviation 3
AVM	5102	Airport Development 3
AVM	5103	Airport Operations 3
AVM	5104	Aviation Economics and Fiscal Management 3
AVM	5105	Aviation Planning and Analysis Techniques 3
AVM	5999	Thesis 6
BUS	5023	Management and Administration of Contracts 3
CVE	5040	Urban Planning 3
EDS	5070	Educational Statistics 3
ENM	5200	Project Engineering 3

Applied Aviation Safety Option

The adviser assists the student in devising a program of study. Each student must complete a Graduate Program Plan (GPP) appropriate for the declared area of concentration by the end of the first semester of enrollment. The resulting GPP requires the approval of both the graduate program chair and the division director. Each student must complete and defend an appropriate thesis.

Summary of Program Requirements

AVM	5101	Legal and Ethical Issues in Aviation 3
AVS	5204	Aviation Safety Analysis 3
AVT	4301	Aviation Safety 3
		Additional Course Work (minimum) 19
		Graduate Statistics (Restricted Elective) 3
		Thesis (maximum) 6
		TOTAL CREDITS REQUIRED 37

Typical Graduate Program Plan

AHF	5101	Human Factors in Man-Machine Systems 3
AHF	5201	Human Performance 1 3
AVM	5101	Legal and Ethical Issues in Aviation 3
AVS	5201	Aviation Meteorology Theory and Practice 3
AVS	5202	Advanced Aviation Meteorology Lab 1
AVS	5203	Impact of Aviation on Human Physiology 3
AVS	5204	Aviation Safety Analysis 3
AVS	5999	Thesis Research 6
AVT	4301	Aviation Safety 3
AVT	5301	Complex Aviation Systems 3
AVT	5302	Aviation Accident Investigation 3
EDS	5070	Educational Statistics 3

International Exchange

In cooperation with France's Ecole Nationale de l'Aviation Civile (ENAC), Florida Tech's School of Aeronautics conducts a special graduate program leading to the Master of Science in Aviation, Airport Development and Management option. For an ENAC student to qualify for this option, the student must have completed a predetermined program at ENAC prior to being accepted for graduate study. Once accepted, the student enrolls at Florida Tech to take seven courses (list available upon request), including the three required courses listed above for this option. Upon completion of these courses and an internship, the Florida Tech M.S.A. is awarded.

Opportunities also exist for Florida Tech students to complete part of their M.S.A. degree requirements in Toulouse, France, by takings courses at ENAC. Additional information is available from the School of Aeronautics.

Aviation Human Factors

Master of Science

"Human factors" refers to the field of study that attempts to identify the principles of human/machine interaction, and applies these principles to the design and operation of engineered systems. Thus, the field is both a rigorous research domain rooted in cognitive, physiological and engineering theory and an applied science with an intimate and direct connection to the operational world.

Although the range of engineered systems of interest in human factors is very wide, this degree concentrates on aviation-related human factors studies. Such studies range from aircraft cockpit design and aircraft maintenance methods and procedures to complex ground-based entities such as the National Airspace System. Human factors is now recognized as an indispensable component of systems design and evaluation, accident investigation and prevention, simulation, training, procedures development and system performance testing. Considerable research is being conducted in this field by government and private entities around the world.

In addition to its advantageous location on the Space Coast, Florida Tech has significant university assets that enhance its potential for aviation human factors research and education.

Admission Requirements

An applicant to the Master of Science in Aviation Human Factors program must have earned a bachelor's degree, or its equivalent, from an institution of acceptable academic standing. Undergraduate course work should include statistics and computer programming in at least one higher-level language. Some aviation background or education is also required. Deficiencies in these areas may be made up through courses taken at the university concurrent with the aviation human factors program course work. Preference is given to candidates with special skills and experience in the fields of aviation software design, engineering, aeronautics, applied psychology or computer science.

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Curriculum

The adviser assists the student in devising a program of study. Each student must complete a Graduate Program Plan (GPP) appropriate for the declared area of concentration by the end of the first semester of enrollment. The resulting GPP requires the approval of both the graduate program chair and the division director. Each student must complete and defend an appropriate thesis.

The Master of Science in Aviation Human Factors requires the satisfactory completion of a minimum of 36 credit hours of approved course work including six hours of Thesis (AHF 5999).

Summary of Program Requirements

AHF 5101 Human Factors in Man-Machine Systems	3
AHF 5991 Sensation and Perception	3
AVM 5101 Legal and Ethical Issues in Aviation	3
Additional Course Work (minimum)	18
Graduate Statistics (Restricted Elective)	3
Thesis (maximum)	6
TOTAL CREDITS REQUIRED	36

Typical Graduate Program Plan

AHF 5101 Human Factors in Man-Machine Systems	3
AHF 5201 Human Performance 1	3
AHF 5202 Human Performance 2	3
AHF 5302 Human-Computer Interaction	3
AHF 5991 Sensation and Perception	3
AHF 5999 Thesis Research	6
AVM 5101 Legal and Ethical Issues in Aviation	3
AVS 4000 Aviation Physiology Lab	1
AVS 4201 Flight Observation Lab	1
AVS 5201 Aviation Meteorology Theory and Practice	3
AVS 5202 Advanced Aviation Meteorology Lab	1
EDS 5070 Educational Statistics	3
EDS 5095 Essentials of Educational Research	3

Thesis Research

A thesis, based on research conducted with the approval of the School of Aeronautics and under the direction of a member of the faculty, is required. Upon completion of nine graduate credits, but prior to completing 15 graduate credits, the student selects a faculty member, with the approval of the option adviser and the graduate program chair, to serve as the thesis research adviser. With the assistance of the adviser, the student selects an advisory committee, prepares a program plan and defines a research topic. The committee must include at least one other member from the School of Aeronautics and one from another degree-granting department of the university. Throughout the project, the adviser and the committee provide assistance and direction to the student and serve as a review board to ensure that thesis requirements are met. After completion of the thesis, the adviser and committee conduct the oral defense of the thesis as described under “Master’s Degree Requirements” in the *Graduate Information and Regulations* section of this catalog. Three to six credits are awarded for successful completion of the thesis.

School of Management

Dean A. Thomas Hollingsworth, Ph.D.

Bachelor of Science

Accounting
Business Administration
Business and Environmental Studies
Information Systems
Management Information Systems

Master of Business Administration

Associate Dean
Barbara G. Pierce, Ph.D.

Director of Spaceport Education Center
John R. Patton, D.B.A.

Professors
LuAnn G. Bean, Ph.D., *accounting choice decisions, financial reporting and valuation, internal auditing, information technology.*

Anthony J. Catanese, Ph.D., *real estate finance, architecture, urban planning.*

A. Thomas Hollingsworth, Ph.D., *enhancement of creativity in organizations, relating pay to performance, small business development, ethical behavior in organizations, health care management.*

T. Roger Manley, Ph.D., *behavior of individuals in work organizations, organizational effectiveness and productivity, work redesign, organizational change and development, measurement and management of work-related stress, measurement of organizational culture.*

Associate Professors
Judith Barlow, Ph.D., *Web-based technologies, high performance database systems, telecommunications and networking, cross-curricular technology integration, distance education, technology innovation.*

Gerard A. Cahill, Ph.D., P.E., *corporate strategy and policy, financial management and planning, general corporate management.*

David D. Hott, Ph.D., *management decisions, operations research quantitative methods for business, management information systems, E-commerce.*

John R. Patton, D.B.A., *international business.*

Barbara G. Pierce, Ph.D., *segmental disclosures and earning predictability, segment information, earnings forecasting, distance education, technology-supported curricula.*

Assistant Professors
Karen Chambliss, Ph.D., *financial management, investments, financial institutions, financial services.*

B. Andrew Cudmore, Ph.D., *quality perceptions, Internet marketing, persuasion knowledge, customer/salesperson interaction, store brand management, customer complaining behavior.*

Theresa A. Domagalski, Ph.D., *organizational behavior, human resources, employee rights and responsibilities, organizational justice, power and resistance to organizational change, emotions in organizations.*

Carolyn J. Fausnaugh, Ph.D., *strategic management, entrepreneurial studies.*

Michael H. Slotkin, Ph.D., *international economics, strategic trade policy, managerial economics, environmental and resource economics.*

Alexander R. Vamosi, Ph.D., *demographic and technological change in macroeconomics, monetary policy, trend movements in income distribution.*

Professors Emeriti
John P. Callahan, Ed.D.; Gerald F. Goldberg, Ph.D.; F. Robert Searle, D.B.A.

Adjunct Professors
D.F. Dement, Ph.D; W.R. Northcutt, J.D.; S.A. Villaire, Ed.D.; D.L. Wildman, J.D.

Lecturer
T.J. Stauffacher, M.S.

Curricula in the School of Management are designed to develop and expand a student's skills and capabilities in preparation for successful leadership in today's dynamic business environment. They provide exposure to the computer tools necessary to compete in the international marketplace, and more importantly they focus on the use of these tools in the decision-making process, thereby providing a value-creating competency for the knowledge-based competitive environment.

Access to high-tech programs on campus, as well as proximity to the space industry's top innovative firms, creates an atmosphere of dynamic change and adaptation important in the rapid product and economic cycles of the twenty-first century. Due to relationships developed with firms in a variety of industries, the school has established an active participation program involving executives from both local companies and multinationals with locations in our area. These executives contribute to our programs in many ways, such as membership on our board of overseers, whose charter is to assure that the school is meeting the needs of employers, as well as the internship program where students obtain practical experience and the mentor program by which students have opportunities to interact with executives one-on-one in preparation for life in management.

The faculty are encouraged to stay on the cutting edge of their fields of expertise and are provided with the technical tools needed to accomplish this goal. They are also heavily involved in student activities and actively pursue opportunities to help each student reach his or her full potential.

The School of Management offers its M.B.A. program on the main campus and at the Spaceport Education Center. Students may enroll in classes offered in Melbourne or at either of the Spaceport Education Center sites, Patrick Air Force Base or John F. Kennedy Space Center. See our Web site: www.som.fit.edu.

Business Administration

Bachelor of Science Degree Programs

Business Administration

The undergraduate program in business administration concentrates on a combination of basic and advanced courses in the various business disciplines. These are coordinated with courses covering current developments in the field, such as environmental aspects, quantitative techniques and computer applications. The emphasis of the business administration curriculum is on relevance, and the courses are continually updated with the objective of equipping each student with a background in the science of management. This will permit students to contribute significantly to their chosen occupations upon graduation.

The curriculum is designed to permit the student to acquire a foundation in all areas of business administration: accounting, business law, information systems, economics, finance, marketing, management, quantitative methods and statistics.

After graduation, the student has an excellent background in the business and management fields and can directly enter the job market, in commerce, industry, government or other areas. Many students may wish to continue into graduate school or enter one of the professional fields such as law, where they will have had an excellent undergraduate preparation.

Candidates for a Bachelor of Science in Business Administration must complete the minimum course requirements as outlined in the following curriculum. A minimum of 50 percent of the business courses must be completed at Florida Tech.

Freshman Year

FALL		CREDITS
BUS 1601	Computer Applications for Business	3
COM 1101	Composition and Rhetoric	3
MTH 1701	College Algebra	3
PSY xxxx	Restricted Elective (Psychology)	3
	Restricted Elective (Science)	3
		15

SPRING		
BUS 2304	Microeconomics	3
COM 1102	Writing about Literature	3
MTH 1702	Applied Calculus	3
	Restricted Elective (Science)	3
	Free Elective	3
		15

Sophomore Year

FALL		CREDITS
BUS 2211	Introduction to Financial Accounting	3
BUS 2303	Macroeconomics	3
BUS 2703	Statistics for Business	3
COM 2224	Business and Professional Writing	3
HUM 2051	Civilization 1	3
		15

SPRING		
BUS 2212	Introduction to Managerial Accounting	3
BUS 2601	Legal and Social Environments of Business	3
COM 2370	Speech	3
HUM 2052	Civilization 2	3
	Free Elective	3
		15

Junior Year

FALL		CREDITS
BUS 3401	Corporate Finance	3
BUS 3501	Management Principles	3
BUS 3601	Marketing Principles	3
	Humanities Electives	6
		15

SPRING		
BUS 3503	Human Resource Management	3
BUS 3504	Management Information Systems	3
BUS 3704	Quantitative Methods	3
BUS xxxx	Restricted Electives (Business)	3
	Humanities Elective	3
		15

Senior Year

FALL		CREDITS
BUS 4501	Production/Operations Management	3
BUS 4502	Organizational Behavior and Theory	3
BUS 4684	Senior Business Research	3
BUS xxxx	Restricted Elective (Business)	6
		15

SPRING		
BUS 4701	International Business	3
BUS 4702	Business Strategy and Policy	3
BUS 4784	Practicum in Business	3
BUS xxxx	Restricted Electives (Business)	6
		15

TOTAL CREDITS REQUIRED 120

Accounting

The undergraduate program in accounting is a traditional four-year accounting program providing a solid business framework. This program includes the Business Practicum (focused on accounting) as well as access to the Corporate Mentor Program. Students planning to take the CPA examination in Florida receive a solid foundation preparing them for the M.B.A. accounting track, where they can earn sufficient credits to be eligible for this examination.

The first two years of the Bachelor of Science in Accounting program are the same as for the Bachelor of Science in Business Administration.

Junior Year

FALL		CREDITS
BUS 3211	Intermediate Accounting 1	3
BUS 3213	Cost and Managerial Accounting 1	3
BUS 3214	Accounting Information Systems	3
BUS 3501	Management Principles	3
	Humanities Elective	3
		15

SPRING		
BUS 3212	Intermediate Accounting 2	3
BUS 3601	Marketing Principles	3
BUS 3704	Quantitative Methods	3
BUS 4211	Internal Audit	3
	Humanities Elective	3
		15

Senior Year

FALL		CREDITS
BUS 3208	Federal Income Tax 1	3
BUS 3401	Corporate Finance	3
BUS 4501	Production/Operations Management	3
BUS 4502	Organizational Behavior and Theory	3
	Humanities Elective	3
		15

SPRING

BUS	42xx	Restricted Elective (Accounting) 3
BUS	4284	Accounting Practicum 3
BUS	4702	Business Strategy and Policy 3
BUS	xxxx	Restricted Electives (Business) 6
		15

TOTAL CREDITS REQUIRED 120

Business and Environmental Studies

This program emphasizes the application of economics to issues associated with the environment and the utilization of natural resources. It familiarizes students with both analytical and decision-making techniques used in assessing environmental concerns and the use of natural resources, and develops a balanced perspective on business and the environment.

Freshman Year

FALL		CREDITS
BUS	1601	Computer Applications for Business 3
COM	1101	Composition and Rhetoric 3
MTH	1701	College Algebra 3
ENS	1001	The Whole Earth Course 3
		Restricted Elective (Psychology) 3
		15

SPRING

BUS	2304	Microeconomics 3
COM	1102	Writing about Literature 3
COM	2370	Speech 3
MTH	1702	Applied Calculus 3
OCN	1010	Oceanography 3
		15

Sophomore Year

FALL		CREDITS
BIO	1010	Biological Discovery 1 4
BUS	2211	Introduction to Financial Accounting 3
BUS	2303	Macroeconomics 3
CHM	1101	General Chemistry 4
		14

SPRING

BIO	1020	Biological Discovery 2 4
BUS	2212	Introduction to Managerial Accounting 3
CHM	1102	General Chemistry 2 4
COM	2224	Business and Professional Writing 3
		Free Elective 3
		17

Junior Year

FALL		CREDITS
BUS	2601	Legal and Social Environments of Business 3
BUS	2703	Statistics for Business 3
BUS	3501	Management Principles 3
ENS	3101	Atmospheric Environments 3
OCN	2602	Environmental Geology 3
		15

SPRING

BUS	3504	Management Information Systems 3
BUS	3601	Marketing Principles 3
BUS	3704	Quantitative Methods 3
ENS	4010	Geographic Information Systems 3
HUM	2051	Civilization 1 3
		15

Senior Year

FALL		CREDITS
BUS	3401	Corporate Finance 3
BUS	4425	Environmental and Urban Planning 3
BUS	4426	Environmental and Resource Economics 3
BUS	4501	Production and Operations Management 3
BUS	4502	Organizational Behavior and Theory 3
HUM	2052	Civilization 2 3
		18

SPRING

BUS	4702	Business Strategy and Policy 3
BUS	4784	Business Practicum 3
		Restricted Electives (Environmental Science) 6
		Restricted Elective (Humanities) 3
		15

TOTAL CREDITS REQUIRED 124

Information Systems

The information systems program offers an interdisciplinary approach that bridges information systems, computing, business and communication disciplines. The integration of information systems, computing technology, business and communication provide a solid foundation for effective management of today's complex systems. The study of information systems emphasizes strategic, managerial, operational and technical aspects of systems using appropriate decision tools, methods and technologies. Verbal and nonverbal communication modes are incorporated into the problem-solving process to promote the use of different information technologies, including multimedia, Web and distributed environments.

Candidates for a Bachelor of Science in Information Systems must complete the minimum course requirement as outlined in the following curriculum. Applicants interested in obtaining the Bachelor of Science degree in Computer Science with an Information Systems option should refer to the appropriate section of this catalog.

Freshman Year

FALL		CREDITS
COM	1101	Composition and Rhetoric 3
CSE	1000	Introduction to Information Systems 3
MTH	1701	College Algebra 3
PSY	xxxx	Restricted Elective (Psychology) 3
		Restricted Elective (Science) 3
		15

SPRING

BUS	2304	Microeconomics 3
COM	1102	Writing About Literature 3
CSE	1001	Fundamentals of Software Development 1 4
MTH	1702	Applied Calculus 3
		Restricted Elective (Science) 3
		16

Sophomore Year

FALL		CREDITS
BUS	2211	Introduction to Financial Accounting 3
BUS	2303	Macroeconomics 3
BUS	2703	Statistics for Business 3
COM	2012	Research Sources and Systems 1
COM	2501	Introduction to Visual Communication 3
CSE	1002	Fundamentals of Software Development 2 4
		17

SPRING

BUS	2212	Introduction to Managerial Accounting 3
BUS	2601	Legal and Social Environments of Business 3
COM	2224	Business and Professional Writing 3
CSE	2010	Algorithms and Data Structures 4
MTH	2051	Discrete Math 3
		16

Junior Year

FALL		CREDITS
BUS	3401	Corporate Finance 3
BUS	3501	Management Principles 3
COM	3440	Public Relations 3
CSE	3030	Legal, Ethical and Social Issues in Computing 3
HUM	2051	Civilization 1 3
		15

SPRING

BUS	3504	Management Information Systems 3
BUS	3601	Marketing Principles 3
BUS	3704	Quantitative Methods 3
CSE	4020	Database Systems 3
HUM	2052	Civilization 2 3
		15

Senior Year

FALL		CREDITS
BUS	4501	Production/Operations Management 3
BUS	4502	Organizational Behavior and Theory 3
COM	3070	Professional Communication for Executives 3
COM	4026	Publishing and the Internet 3
CSE	4220	Systems Analysis and Design 3
		15

SPRING

BUS	4702	Business Strategy and Policy 3
BUS	4784	Business Practicum 3
COM	4424	Advanced Business and Professional Communication 3
CSE	4221	Systems Development Workshop 3
		Humanities Elective 3
		15

TOTAL CREDITS REQUIRED 124

Management Information Systems

The management information systems program provides an opportunity for students to gain valuable skills for use in a wide variety of organizations. As the liaison between information systems and management, graduates are able to provide significant, valuable contributions to the decision-making capabilities of an organization. The course work provides a solid understanding of the business core (management, accounting, finance, marketing and economics), supplemented by specialized knowledge of information systems and capabilities. The business practicum (focused on management information systems) provides students an opportunity to hone their skills in a real world environment, enabling them to confidently enter their future positions ready to make meaningful contributions.

Candidates for a Bachelor of Science in Management Information Systems must complete the minimum course requirements as outlined in the following curriculum. The first two years are the same as for the Bachelor of Science in Business Administration.

Junior Year

FALL		CREDITS
BUS	3501	Management Principles 3
BUS	3504	Management Information Systems 3
BUS	3510	Advanced Business Computer Applications 3
BUS	3601	Marketing Principles 3
		Humanities Elective 3
		15

SPRING

BUS	3401	Corporate Finance 3
BUS	3512	System Design and Development for Business 3
BUS	3514	Introduction to Operating Systems and Networks for Business 3
BUS	3704	Quantitative Methods 3
		Humanities Elective 3
		15

Senior Year

FALL		CREDITS
BUS	4501	Production and Operations Management 3
BUS	4502	Organizational Behavior and Theory 3
BUS	4508	Web Technology for Business 3
BUS	4509	Management of Database Systems 3
		Humanities Elective 3
		15

SPRING

BUS	3503	Human Resource Management 3
BUS	4583	Senior Project 3
BUS	4584	MIS Practicum 3
BUS	4701	International Business 3
BUS	4702	Business Strategy and Policy 3
		15

TOTAL CREDITS REQUIRED 120

Master of Business Administration Degree Program

Admission Requirements

The applicant to the master of business administration program must have a bachelor's degree; however, the degree need not be in business administration. Applicants who are graduates of nonbusiness programs are encouraged to apply, but may be required to complete certain foundation courses to better prepare for some of the advanced business courses in the M.B.A. program. The number of needed foundation courses depends on the business courses completed by the applicant during his or her undergraduate studies. An applicant is assigned an adviser soon after acceptance into the M.B.A. program, and should meet with the adviser to prepare a program plan outlining the courses needed for the M.B.A. degree.

All applicants are required to take the Graduate Management Admissions Test (GMAT) and obtain a satisfactory score for admission to the M.B.A. program. The only exceptions to this policy are applicants who hold a master's degree at the time of application and Florida Tech School of Management graduates with a 3.25 GPA or better. In the United States, the GMAT is only available through Computer-Adaptive Testing (CAT) at specifically designated sites. Unofficial scores are available immediately after the test. Official scores are mailed within 10–15 days of the exam. Official scores should not be more than five years old.

In certain cases, a student may be admitted prior to receipt of an acceptable GMAT score, and in such a case the unsatisfied requirement will be treated as a deficiency and will result in Provisional Student status. The student will be notified of the provisional status and of the GMAT score needed to remove the deficiency. Registration for more than a cumulative total of nine credits prior to removal of the deficiency is not permitted.

General admission requirements, student classifications and the process for applying are presented in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The Master of Business Administration degree is conferred upon a student who has successfully completed 36 credit hours of core and elective courses as listed on the student's approved Graduate Program Plan. Additional foundation courses may be required depending on the applicant's undergraduate preparation.

Curriculum

Core Courses

The M.B.A. degree requires completion of a common set of nine core courses as shown below. These core courses are designed to prepare the student to respond to the complex

business decisions that arise in today's rapidly changing environment. The student must complete the foundation requirements, if any, before registering for core courses or electives.

The following core courses are required of all M.B.A. students:

BUS 5411 Statistical Methods for Business 3
BUS 5421 Managerial Economics 3
BUS 5431 Managerial Accounting 3
BUS 5440 Financial Management 3
BUS 5450 Organizational Behavior 3
BUS 5460 Management Information Systems 3
BUS 5461 Production and Operations Management 3
BUS 5470 Marketing Management 3
BUS 5480 Strategic Management 3
TOTAL CORE CREDITS 27

Elective Courses

In addition to the nine core courses, students are also required to take three elective courses. Electives can be taken with the faculty adviser's approval from other graduate-level offerings in the School of Management or other schools or academic units.

Foundation Courses

Foundation courses are required of a student whose undergraduate major is outside the business area or who has not previously completed courses in these foundation areas. The exact number of needed foundation courses depends on courses previously completed by the student.

The following foundation courses are designed to better prepare a student for M.B.A. core courses:

BUS 5400 Legal, Ethical and Social Environment of Business
BUS 5410 Quantitative Methods for Business Decisions
BUS 5420 Macroeconomics
BUS 5430 Financial Accounting

Thesis Track

A thesis track exists for students with a strong business administration background. A maximum of six credit hours of thesis work, depending on the particular subject, may be taken in place of elective course work. The choice of thesis subject and the amount of thesis credit to be taken must be approved in advance by the student's adviser.

Accounting Track

Students with the required accounting prerequisites may elect to take the accounting track by selecting four of the five accounting courses listed below. These four courses will be substituted for BUS 5431 Managerial Accounting (accounting for non-business majors) and the three electives. The remaining eight core courses and foundation requirements are the same as for the general M.B.A. degree.

BUS 5432 Advanced Accounting
BUS 5433 Advanced Problems and Current Topics
BUS 5434 Advanced Auditing Theory and Application
BUS 5435 Tax and Financial Accounting Research
BUS 5436 Government and Nonprofit Accounting

Acquisition and Contract Management Track

Students may follow the acquisition and contract management track by selecting three business electives from the following list. In addition, BUS 5214 (Cost Principles, Effectiveness and Control) may be substituted for BUS 5431. The remaining eight core courses and foundation requirements are the same as for the general M.B.A. degree.

BUS 5211 Procurement and Contract Management
BUS 5213 Contract Changes, Terminations and Disputes
BUS 5217 Contract and Subcontract Formulation
BUS 5218 Contract Negotiations and Incentive Contracts
BUS 5220 Contract Management Research Seminar

This concentration is offered only at the Spaceport Education Center.

Master of Science in Engineering Management

The master of science program in engineering management is an interdisciplinary program administered by the College of Engineering that is offered both on the main campus and, with the cooperation of the School of Management, at the Spaceport Education Center. See "Engineering Management" in the *College of Engineering* section of the catalog for a description of the program.

School of Psychology

Dean Mary Beth Kenkel, Ph.D.

Bachelor of Arts
Psychology

Bachelor of Science
Psychology

Master of Science
Applied Behavior Analysis
Industrial/Organizational Psychology

Doctor of Psychology
Clinical Psychology

Doctor of Philosophy
Industrial/Organizational Psychology

Associate Dean for Practicum Development
Thomas H. Peake, Ph.D.

Professors
Arthur Gutman, Ph.D., *personnel law, program evaluation, applied statistics, personnel psychology, research design.*

Thomas H. Harrell, Ph.D., *psychometrics and computerized psychological assessment, use of MMPI-2 in clinical evaluation, cognitive-behavioral approaches to assessment and therapy; adaptation to aging.*

Mary Beth Kenkel, Ph.D., *clinical/community psychology, rural mental health, gender issues, telehealth, prevention, future of professional psychology.*

Thomas H. Peake, Ph.D., *brief psychotherapies, couples therapy, healthy aging, clinical training, neuropsychology.*

Frank M. Webbe, Ph.D., *sport psychology, neuropsychological correlates of athletic trauma, neuropsychology and aging.*

Visiting Professor
Florence Kaslow, Ph.D., *marital/family, divorce and remarriage-dynamics and treatment, divorce mediation, sexual dysfunction, personality disorder.*

Associate Professors
Juanita N. Baker, Ph.D., *child sexual abuse, measurements of behavioral change (child misbehavior, grieving, depression, PTSD symptoms, eating disorders), evaluation of teaching, training and program effectiveness.*

Richard T. Elmore Jr., Ph.D., *marital and sex therapy, clinical hypnosis, traumatology, occupational health psychology.*

Philip D. Farber, Ph.D., *psychological assessment, alcohol/drug abuse, clinical training issues.*

William K. Gabrenya Jr., Ph.D., *cross-cultural differences in group interaction, Chinese culture, social class and modernization, international student adjustment, indigenous psychologies.*

Radhika Krishnamurthy, Psy.D., *personality assessment with the MMPI-E/MMPI-A and Rorschach, child and adolescent development, interface between personality and neuropsychological functioning.*

José Martinez-Diaz, Ph.D., *in-home behavioral programs for children, teaching language to autistic children, antecedent strategies in behavior change.*

Assistant Professors
Richard L. Griffith, Ph.D., *response distortion on noncognitive selection procedures, advanced measurement issues, organizational innovation, cognitive processes of work teams.*

Monique Levermore, Ph.D., *multicultural approaches to psychotherapy, diversity issues in clinical training, risk and resilience, under-served populations, international consultation, forensic psychology.*

Lisa Steelman, Ph.D., *job performance feedback processes, performance appraisal, multirater feedback, organizational survey research, employee commitment and engagement.*

Professors Emerita
Carol L. Philpot, Psy.D.; Elizabeth B. Wolf, Ph.D.

Professor Emeritus
Charles D. Corman, Ph.D.

Adjunct Professors
P. Beighley, M.D.; J.J. Beltran, Ph.D.; D. Bersoff, Ph.D.; E.Q. Blakely, Ph.D.; V.J. Carbone, Ph.D.; W.E. Eyring, III, Psy.D.; E. Galluscio, Ph.D.; M.A. Gerardi, Ph.D.; P.W. Gorman, Psy.D.; B.L. Hensel, Ph.D.; E.L. Levine, Ph.D.; J.D. Shuy, Psy.D.; C. Stevens, Psy.D.; M. Stoutimore, Ph.D., M. Tims, Psy.D.; W.S. Whitacre, Psy.D.

Lecturers
J. Becker, M.A.; M. Jones, M.S.

Mission Statement

The mission of the School of Psychology is to enhance the human condition through education, research, scholarship, and the delivery of psychological services within an environment that develops, supports and rewards excellence in these endeavors. This mission is based upon the following beliefs and values.

1. A healthy, participatory environment maximizes faculty and student potential. This environment is based on respect for individuality and diversity, is sensitive to individual and organizational needs and is receptive to change.

2. Our training program is based on integrity in all its components, and is responsible to the public at the university, local and national level for quality and excellence in training. We are committed to excellence in both process and product.

3. We have the opportunity to set a new standard and model for Schools of Psychology, one that combines the strong professional training model upon which we have earned our reputation with a strong research/scholarly model through which we advance the frontiers of knowledge in professional psychology.

Accreditation

The doctor of psychology program in clinical psychology is fully accredited by the American Psychological Association and is listed as a designated doctoral program in psychology by the National Register of Health Service Providers in Psychology.

The School of Psychology is a member of the Council of Applied Masters Programs in Psychology, and its master of science program in industrial/organizational psychology has been certified as conforming to the standards of the council.

Organization

In addition to its undergraduate and graduate degree programs, the school administers and staffs the Counseling and Psychological Services Center (CAPS), the Community Psychological Services of Florida Tech (CPS), the Center for Professional Services, the Center for Traumatology Studies, the East Central Florida Memory Disorder Clinic (MDC) and the Family Learning Program (FLP). Counseling and psychological services are provided by CAPS to the students, staff and faculty of the university, and by CPS to the local community. MDC provides memory screenings as well as neuropsychological assessment and counseling. The MDC and FLP programs are state-supported.

Facilities

The Psychology Building, containing offices, classrooms, human research areas, observation and treatment rooms, computer facilities, a conference room, a faculty/staff/student lounge and a student reading room, is located on Florida Tech's main campus, as are CAPS and CPS. MDC is also located in Melbourne, near Holmes Regional Medical Center.

Financial Assistance

General financial assistance information including assistantships and Veterans Administration benefits are addressed in the *Expenses and General Information* section of this catalog.

Students may be eligible to work for remuneration with faculty members on their various research and service contracts. Information can be obtained from the department or the individual faculty member.

Students may wish to consider the various loan programs that are available to them and may wish to contact the Office of Financial Assistance at the university to investigate other possible support.

Forms for requesting graduate assistantships are included in all graduate application packets or can be obtained from the School of Psychology and must be submitted to that office prior to February 1 to be eligible for consideration for the next academic year.

A limited number of assistantships and scholarships are available to students in the psychology graduate program. These include:

General graduate assistantships—These assistantships may involve both stipends and tuition remission. General graduate assistants are expected to perform 5–20 hours of work per week in activities related to teaching, research or clinical services. Assistants are normally rotated through these types of activities during the various nonsummer semesters.

Graduate teaching assistantships—These assistantships involve both stipends and tuition remission. They involve the teaching of undergraduate courses and graduate assessment laboratories under supervision and are normally awarded to post-master's students.

Merit scholarships—Merit scholarships for undergraduate students are dependent on available funding. Please contact the School of Psychology.

Admission

As a Freshman

New freshman applicants usually complete a college-preparatory curriculum in high school and have taken four years of English, and three years each of mathematics, natural sciences and social sciences. Applicants are evaluated on the basis of their SAT/ACT scores, high school grade point averages and grades in specific courses, particularly English, social studies and science.

Tests administered to all entering freshmen during the week preceding the start of classes each fall semester are designed to determine appropriate placement in mathematics. Each student is placed according to degree program and mathematics background. Students in the B.A. program are typically placed in college algebra or precalculus. Students in the B.S. program are typically placed in precalculus math or calculus.

As an Undergraduate Transfer Student

Admission decisions for transfer students are made on the basis of a combination of the criteria used for new freshmen, college grade point average and grades in specific courses applicable to the psychology major. Where one or more years of college-level course work have been completed, the admission decision will be predominantly based on accomplishment in these studies.

Undergraduate transfer credit may be granted for course work completed with a grade of C or above at other fully accredited two- and four-year colleges and universities in the United States or at recognized universities abroad. Transfer students who have majored in liberal arts (social science or humanities) at their former colleges will usually be able to transfer most of their course work to the university's psychology major, so that little or no time is lost in completing the degree. Transfer students from community colleges will also be able to transfer most of their course work.

For undergraduate courses only, students can request equivalency examinations if transfer credit is not awarded for a course passed at another institution. Successful completion of an equivalency examination may be required if there is serious doubt about the equivalency of a course taken elsewhere.

As a Graduate Student

Graduate admission requirements are described separately for each graduate-level degree program in the sections that follow.

Graduate Student Agreement

The following statement is specific to the agreement assumed between a prospective psychology graduate student and the School of Psychology. A resolution adopted by the Council of Graduate Schools in the United States, and supported by 362 universities and colleges, reads as follows:

> *Acceptance of an offer of financial aid (such as graduate scholarship, fellowship, traineeship or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement that both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer. It is further agreed by the institutions and organizations subscribing to the above Resolution that a copy of this Resolution should accompany every scholarship, fellowship, traineeship and assistantship offer.*

The School of Psychology endorses the following resolution of the Council of Graduate Departments of Psychology regarding the offering and accepting of financial aid after April 15:

> *An acceptance given or left in force after April 15 commits the student not to solicit or accept another offer. Offers made after April 15 must include the provision that the offer is void if acceptance of a previous offer from a department accepting this Resolution is in force on that date. These rules are binding on all persons acting on the behalf of the offering institution.*

Psychology

Bachelor of Arts
Bachelor of Science

Program Chair
William K. Gabrenya Jr., Ph.D.

The bachelor's programs in psychology are designed to provide both a solid basis for graduate training in all areas of psychology, and a liberal arts and sciences education to students planning other careers or professions, such as law or business.

The B.A. and B.S. degrees differ broadly in their relative emphasis on traditional liberal arts and sciences course work. The B.A. degree is designed for students whose interests are primarily in the social sciences and humanities, while the B.S. degree is designed for students more oriented toward the natural sciences and mathematics. Students consult with their faculty advisers to select the degree program most appropriate to their interests and goals.

The undergraduate psychology degree programs are designed to allow students to customize their course work to meet their specific interests and needs. Course work within the psychology major includes a 27-hour psychology "core" and an additional 21-hour psychology concentration that includes courses in psychology and other areas that are deemed appropriate to the students' intellectual goals and interests in psychology. The concentration must be approved by the undergraduate program chair.

Courses are offered in the department to facilitate a variety of concentrations. Examples of concentrations that students might find attractive are clinical/counseling psychology, forensic psychology, industrial/organizational psychology and animal behavior. Students may also design concentrations appropriate to pursuing postgraduate education in law, medical fields, business and the experimental fields of psychology.

Bachelor of Arts Degree Program

Degree Requirements

Psychology Core (27 credits, *see below*)

Psychology Concentration (21 credits, *see below*)

Language and Communication (21 credits)

COM 1101	Composition and Rhetoric	3
COM 1102	Writing about Literature	3
COM 3070	Professional Communication for Executives	3
	Foreign Languages (two semesters)	6
	Communications Electives[1]	6

Humanities and Social Sciences (18 credits)

HUM 2051	Civilization 1	3
HUM 2052	Civilization 2	3
	Humanities Elective	3
	Social Science Electives[2]	9

Mathematics and Science (15 credits)

BUS 2703	Business Statistics	3
or		
MTH 2401	Probability and Statistics	3
	Physical Science[3]	3
	Life Science[4]	3
	Science Elective[5]	3
MTH 1701	College Algebra	3
or		
MTH 1000	Precalculus	3
	Free Electives	18
	TOTAL CREDITS REQUIRED	120

Bachelor of Science Degree Program

Degree Requirements

Psychology Core (27 credits, *see below*)

Psychology Concentration (21 credits, *see below*)

Communication (9 credits)

COM 1101	Composition and Rhetoric	3
COM 1102	Writing about Literature	3
COM 2223	Scientific and Technical Communication	3

Humanities and Social Sciences (18 credits)

HUM 2051	Civilization 1	3
HUM 2052	Civilization 2	3
HUM 3351	History of Science and Technology 1	3
HUM 3352	History of Science and Technology 2	3
	Humanities Elective	3
	Social Science Elective[2]	3

Mathematics and Science (25 credits)

BIO 1010	Biological Discovery 1	4
BIO 1020	Biological Discovery 2	4
or		
CHM 1101	Chemistry 1	4
CHM 1102	Chemistry 2	4
or		
PHY 1001	Physics 1	4
PHY 2002	Physics 2	4
BUS 2703	Business Statistics	3
or		
MTH 2401	Probability and Statistics	3
MTH 1001	Calculus 1	4
MTH 1002	Calculus 2	4
	Technical Electives[5]	6
	Free Electives	20
	TOTAL CREDITS REQUIRED	120

Psychology Core

PSY 1400	Freshman Seminar	1
PSY 1411	Introduction to Psychology	3
PSY 2511	Introduction to Research Methods for Psychology	3
PSY 3400	Junior Seminar	1
Two of the following three courses		6
PSY 2441	Child and Adolescent Development	
or		
PSY 2442	Adult Development and Aging	
PSY 3441	Social Psychology	
PSY 3442	Psychology of Personality	
Two of the following three courses		6
PSY 3421	Psychology of Learning and Motivation	
PSY 3422	Cognitive and Perceptual Psychology	
PSY 3423	Physiological Psychology	
PSY 3511	Advanced Research Methods for Psychology	3
PSY 4400	Senior Seminar	1
PSY 4411	Internship	3
or		
PSY 4415, 4416	Senior Thesis[6]	6

Suggested Concentrations

Clinical/counseling psychology—Students interested in pursuing postgraduate study in clinical, counseling or school psychology, or in obtaining employment in a mental health or social service agency after graduation should study in areas that will familiarize them with these occupations and build basic skills. Such areas of study include substance abuse, abnormal psychology, clinical psychology, professional ethics, counseling techniques and applied behavior analysis. Course work in behavior analysis can lead to certification as a Behavior Analyst in the state of Florida after completion of other requirements and a certification examination.

Forensic psychology—This concentration is designed to provide exposure to the fields of criminology, criminal justice and forensic psychology in preparation for graduate work in one of these areas or employment in law enforcement. Recommended courses in this concentration include Psychology of Personality, Social Psychology, Abnormal Psychology, Cross-Cultural and Ethnic Psychology, Substance Abuse, and Child and Adolescent Development, as well as courses in sociology, especially deviance, social problems and family.

Industrial/organizational psychology—Students who plan to enter business directly after graduation, apply to an M.B.A. program or apply for graduate programs in personnel or industrial/organizational psychology should select courses in psychology and business that will help define their interests, prepare them for graduate school admission or develop skills. Some areas of study useful in this regard include industrial/organization psychology, business law, management, human resource management, organizational behavior and substance abuse.

Animal behavior—Students interested in seeking postgraduate training at an appropriate facility to pursue a career in animal behavior, such as training marine mammals, should take Biological Discovery 1 and 2 and a combination of psychology and biology courses in the areas of learning and behavior analysis, anatomy, zoology, ecology, and the biology of marine mammals and other vertebrates. SCUBA and CPR certifications are recommended. An internship in an animal training facility should be performed. The bachelor of science degree program is recommended for students in this concentration.

[1] The Communications Electives may be satisfied by any COM 3xxx or 4xxx courses, foreign languages or linguistics.

[2] Social Science Electives exclude PSY courses except PSY 2444.

[3] Physical Science courses include chemistry, geology, meteorology, physics, space sciences and EDS 1032.

[4] Life Science courses include biology, ecology and EDS 1031.

[5] Science and Technical Electives exclude mathematics courses below the 2xxx level.

[6] For thesis students, the required credits for Free Elective or Psychology Concentration are reduced by three.

Industrial/Organizational Psychology

Master of Science *Doctor of Philosophy*

Program Chair
Richard L. Griffith, Ph.D.

Industrial/organizational (I/O) psychology is concerned with applying professional skills and focusing scientific research on problems people encounter at work.

The industrial/organizational programs at Florida Tech follow the scientist-practitioner model of graduate training, emphasizing the development of research skills, knowledge of I/O theory and techniques, and applied experiences. Through extensive course work, students receive great breadth in training, focusing on industrial psychology, organizational psychology and measurement/statistics. Florida Tech offers both M.S. and Ph.D. level training in industrial/organizational psychology. The goal of these programs is to train well-rounded I/O psychologists who have flexibility in their career paths and the skills to make a significant difference in society.

Master of Science Degree Program

The goal of the master's program is to offer a two-year terminal degree that prepares master's-level professionals to work within the broad human resource function in organizations. In addition, the program serves as a preparatory sequence for those graduate students who wish to continue their education in a doctoral program. To accomplish this goal, the master's program addresses the prediction and measurement systems necessary for making accurate personnel decisions with respect to the selection, placement, training and evaluation of employees. It covers the impact of group and other social influences on job-related behaviors, motivation, commitment and communication, and is also concerned with planned change within the organization.

The primary culminating experience that prepares the I/O psychology student for a career is the practicum. Practicum experiences reflect a wide variety of career opportunities within the business environment. Ideal career placements for graduates would include positions in employee selection and placement, performance appraisal, training and evaluation, organizational development, compensation and benefits, and employee relations.

Students who plan to continue on a traditional academic track may opt to complete the master's thesis. The thesis track allows a student to work with a faculty member on an independent research project. Students are mentored in areas such as research design, data collection, database management, statistical analysis and preparing a document for submission. Students are also encouraged to develop their computer literacy, critical evaluation and problem-solving skills.

Admission Requirements

A master's applicant should hold a bachelor's degree in psychology or business, although graduates from other fields are encouraged to apply. A student without a bachelor's degree in psychology may be required to complete up to nine credit hours of psychology course work at the undergraduate level before registering for graduate-level courses. These courses are in addition to the 45-credit degree requirement.

A master's applicant should have a grade point average of 3.0 (B) or higher, and should submit three letters of recommendation, a statement of career objectives, supplement form and GRE General Test scores. Official transcripts of all undergraduate and graduate courses attempted must be submitted. All applications should be submitted by February 1, but will be accepted throughout the year. Preadmission visits to the campus and conferences with faculty and students are strongly encouraged.

Degree Requirements

The Master of Science in Industrial/Organizational Psychology requires the satisfactory completion of a minimum of 45 credit hours of approved course work and the passing of a comprehensive examination administered in the semester of graduation, or successful defense of a master's thesis.

Curriculum

Foundations of Psychology (12 hours)

PSY 5101 Statistical Research Methods 1 3
PSY 5102 Statistical Research Methods 2 3
PSY 5402 Tests and Measurements 3
PSY 5403 Applied Research Methods 3

Industrial/Organizational Core Courses

PSY 5401 Introduction to I/O Psychology 3
PSY 5411 Personnel Selection 3
PSY 5412 Performance Appraisal 3
PSY 5413 Personnel Law 3
PSY 5415 Organizational Psychology 3
PSY 5421 Industrial Training 3
PSY 5422 Group and Team Development 3
PSY 5492 Current Topics in I/O Psychology 3
PSY 5999 Thesis 6
Elective 3
TOTAL CREDITS REQUIRED 45

Typical Electives

BUS 5032 Personnel Management and Industrial Relations
PSY 5420 Organizational Change and Transformation
PSY 5423 Career Development in Organizations
PSY 6401 Organizational Leadership
PSY 6402 Chaos Theory in Organizations
PSY 6403 Organizational Program Evaluation
PSY 6410 Organizational Survey Methods

Typical Program Plan

Year 1

FALL CREDITS
PSY 5101 Statistical Research Methods 1 3
PSY 5401 Introduction to I/O Psychology 3
PSY 5415 Organizational Psychology 3
PSY 5492 Current Topics in I/O Psychology 1
10

SPRING
PSY 5102 Statistical Research Methods 2 3
PSY 5402 Tests and Measurements 3
PSY 5412 Performance Appraisal 3
PSY 5492 Current Topics in I/O Psychology 1
10

SUMMER
PSY 5422 Group and Team Development 3

Year 2

FALL CREDITS
PSY 5403 Applied Research Methods 3
PSY 5411 Personnel Selection 3
PSY 5492 Current Topics in I/O Psychology 1
Elective 3
10

SPRING
PSY 5413 Personnel Law 3
PSY 5421 Industrial Training 3
PSY 5496 Practicum in I/O Psychology 6
or
PSY 5999 Thesis 6
12
TOTAL CREDITS REQUIRED 45

Doctor of Philosophy Degree Program

Florida Tech's doctoral degree in industrial/organizational (I/O) psychology provides training and research opportunities in the complex issues associated with the management of human resources in the international business community. It is designed to provide a more advanced level of education as well as the opportunity to continue independent research. The program encourages graduate students to partner with outside organizations to address applied research problems and collect data that advances the field. The I/O program offers students rigorous quantitative and qualitative training, as well as advanced training in research design. Once the projects are completed, students are required to prepare the results for professional conferences and submission to academic journals. Throughout this process graduate

students work closely with their faculty advisers and other I/O faculty. The small class size of the Ph.D. program facilitates close interaction and augments the mentoring process. Although the Ph.D. degree is primarily a research degree, the skills acquired by graduates of the I/O psychology program are designed to translate to both external and internal consulting environments. Students are encouraged to pursue a practicum in the field. The I/O psychology program produces qualified professionals for teaching and research in academic settings, as well as internal and external consulting positions.

Admission Requirements

A doctoral applicant should hold a bachelor's or master's degree, with a grade point average of 3.2 (on a scale of 4.0) or higher, and should submit three letters of recommendation, a statement of career objectives, supplement form and GRE General Test scores. Official transcripts of all previous course work must be submitted. All applications should be submitted by February 1, but will be accepted throughout the year. Admission to the doctoral program is granted to a limited number of students. Preadmission contact with the faculty is highly encouraged.

Degree Requirements

The doctoral program requires 90 semester hours of credit beyond the bachelor's degree. Students entering with master's degrees in I/O psychology or related fields are evaluated on a case-by-case basis for possible award of transfer credit. Students are strongly encouraged to complete the requirements for the Ph.D. within four years.

The I/O doctoral program is designed to progress from general course work to courses that are more specific in content. In the first year, students receive intensive training in quantitative methods and computer applications, and study the foundations of general psychology. A student who has not previously carried out a master's thesis is required to do so, and should start in the first year. In the second year students begin to take more specialized courses in I/O psychology, finish their fundamental requirements and enroll in an advanced research methods course. Most students who are required to carry out master's theses should complete them by the conclusion of the second year. The third year offers more specialized courses. During the third year, students are encouraged to complete an internship assignment in a corporate, government or consulting environment. Comprehensive examinations take place at the end of the third year.

The doctoral degree in I/O psychology is a research degree. Dissertation research is begun immediately after successful completion of the comprehensive examination. Typically, the fourth year is devoted to the completion of the doctoral dissertation. Prior to the award of the doctoral degree, the candidate must present the completed dissertation manuscript and defend the research results to the Dissertation Committee. Students may continue to enroll in special courses and advanced seminars.

Curriculum

Foundations of Psychology (12 hours, selected from the foundation courses listed for the master's degree and the following)

PSY 5104 Learning and Memory 3
PSY 5105 Biological Foundations of Behavior 3
PSY 5111 Cognition 3
PSY 5120 Culture and Psychology 3

Industrial/Organizational Core Courses and Electives
(see the lists for the master's degree)

Dissertation
PSY 6999 Dissertation 24–30

Typical Program Plan

Year 1

FALL	CREDITS
PSY 5101 Statistical Research Methods 1	3
PSY 5401 Introduction to I/O Psychology	3
PSY 5415 Organizational Psychology	3
PSY 5492 Current Topics in I/O Psychology	1
	10

SPRING	
PSY 5102 Statistical Research methods 2	3
PSY 5104 Learning and Memory	3
PSY 5402 Tests and Measurements	3
PSY 5492 Current Topics in I/O Psychology	1
	10

SUMMER	
PSY 5422 Group and Team Development	3

Year 2

FALL	CREDITS
PSY 5120 Culture and Psychology	3
PSY 5403 Applied Research Methods	3
PSY 5411 Personnel Selection	3
PSY 5492 Current Topics in I/O Psychology	1
	10

SPRING	
PSY 5412 Performance Appraisal	3
PSY 5413 Personnel Law	3
PSY 5999 Thesis	6
	12

SUMMER	
PSY 6401 Organizational Leadership	3

Year 3

FALL	CREDITS
PSY 5496 Practicum in I/O Psychology	6
PSY xxxx Elective	3
	9

SPRING	
PSY 5421 Industrial Training	3
PSY 6999 Dissertation	6
PSY xxxx Elective	3
	12

Year 4

FALL	CREDITS
PSY 6405 Multivariate Statistics	3
PSY 6999 Dissertation	9
	12

SPRING	
PSY 6999 Dissertation	9

Research Activities

Faculty and graduate students are actively engaged in a variety of research topics, including the use of personality measures in selection, structural equation modeling, cognitive processes of work teams, employment law, training evaluation, the role of feedback in organizational survey topics and differences in work attitudes across cultures.

Applied Behavior Analysis

Master of Science

Program Chair
José Martinez-Diaz, Ph.D.

Applied behavior analysis (ABA) is the design, implementation and evaluation of environmental modification to produce socially significant improvements in behavior. ABA includes the use of direct observation, measurement and functional analysis of the relations between environment and behavior. Based on the findings of descriptive and functional analysis, ABA uses antecedent stimuli and consequences to produce practical change. ABA is based on sound scientific principles and has a solid research foundation that proves its effectiveness. ABA is based on the belief that an individual's behavior is determined by past and current environmental events in conjunction with organic variables such as genetics. Thus, it focuses on explaining behavior in terms of external events (that can be manipulated) rather than internal constructs (that are beyond our control).

Behavior analysts may specialize in clinical applications (e.g., developmental disabilities, mental health, traumatic brain injury), educational applications (e.g., designing and evaluating instructional technology), organizational behavior management (working with business and industry) and other areas. They typically spend more time in the "problem" environment than in their offices; that is, behavior plans are implemented in the settings where behavior problems occur, rather than the client attending sessions at an office.

The Master of Science in Applied Behavior Analysis prepares graduates for employment as Board Certified Behavior Analysts (BCBAs) in private, community and state agencies. The Behavior Analyst Certification Board Inc. has approved the Florida Tech ABA course sequence as meeting the course work requirements for eligibility to take the Board Certified Behavior Analyst examination.

Admission Requirements

An applicant should hold a bachelor's degree in psychology, education, or other related fields, although graduates from other fields are encouraged to apply. A student without a bachelor's degree in psychology may be required to complete up to nine credit hours of psychology course work at the undergraduate level before registering for graduate-level courses; these undergraduate courses include introductions to psychology, learning, and biological psychology or the equivalent. These courses are in addition to the 48-credit degree requirement.

An applicant should have a grade point average of 3.0 (B) or higher, and should submit three letters of recommendation, a statement of career objectives and Graduate Record Examination General Test scores. Official transcripts of all undergraduate and graduate courses attempted must be submitted. All applications should be submitted by March 1 for the following fall, but will be accepted throughout the year. Preadmission visits to the campus and conferences with faculty and students are strongly encouraged.

Degree Requirements

The Master of Science in Applied Behavior analysis requires the satisfactory completion of a minimum of 48 semester credit hours (nine of which are behavior analysis practica) and the successful completion of a comprehensive examination administered during the semester of graduation. Students may complete the program on a full-time or part-time basis.

Curriculum

Foundations of Psychology

PSY	5105	Biological Foundations of Behavior 3
PSY	5511	Clinical Psychopharmacology 3
PSY	5541	Clinical Skills and Techniques 3
PSY	5591	Seminar in Professional Standards and Ethical Principles in Psychology 1
		10

Specialty Area—Applied Behavior Analysis

PSY	5231	Basic Concepts and Principles of Behavior Analysis 4
PSY	5232	Applied Behavior Analysis 1 4
PSY	5233	Applied Behavior Analysis 2 4
PSY	5234	Research Methods in Applied Behavior Analysis 4
PSY	5235	Ethical and Professional Standards and Social Issues in Applied Behavior Analysis 1
PSY	5237	Applied Behavior Analysis 3 3
PSY	5295	Behavior Analysis Practicum 9
		29

Electives 9

TOTAL CREDITS REQUIRED 48

Sample Electives

PSY	5236	Behavior Analysis in Autism and Other Developmental Disabilities 2
PSY	5292	Seminar in Behavior Analysis 1
PSY	5543	Psychotherapy with Children 3
PSY	5561	Children's Behavior Disorders 3

Typical Program Plan

Year 1

FALL		CREDITS
PSY	5231	Basic Concepts and Principles of Behavior Analysis 4
PSY	5232	Applied Behavior Analysis 1 4
PSY	5541	Clinical Skills and Techniques 3
PSY	5591	Seminar in Professional Standards and Ethical Principles in Psychology 1 1
		12

SPRING		
PSY	5105	Biological Foundations of Behavior 3
PSY	5233	Applied Behavior Analysis 2 4
PSY	5236	Behavior Analysis in Autism and Other Developmental Disabilities 2
PSY	5292	Seminar in Behavior Analysis 1
		10

SUMMER		
PSY	5295	Practicum 3
		3

Year 2

FALL		CREDITS
PSY	5234 Research Methods in Applied Behavior Analysis	4
PSY	5235 Ethical and Professional Standards and Social Issues in Applied Behavior Analysis	1
PSY	5292 Seminar in Behavior Analysis	1
PSY	5295 Practicum in Applied Behavior Analysis	3
PSY	5511 Clinical Psychopharmacology	3
		12

SPRING		
PSY	5237 Applied Behavior Analysis 3	3
PSY	5292 Seminar in Behavior Analysis	1
PSY	5292 Seminar in Behavior Analysis	1
PSY	5295 Practicum in Applied Behavior Analysis	3
PSY	5543 Psychotherapy with Children	3
		11

Clinical Psychology

Doctor of Psychology

Program Chair and Director of Clinical Training
Philip D. Farber, Ph.D.

School of Psychology doctoral candidates work toward the degree of Doctor of Psychology (Psy.D.)—a service-oriented degree emphasizing clinical skills. The program leading to the Psy.D. is based on a practitioner/scientist model. Florida Tech was the first university in the southeast to offer the Psy.D. and the model of training that it represents. In addition to classes and seminars, the training program in clinical psychology includes supervised experience in testing, diagnosis, counseling and therapy, and research projects related to special fields of interest. Prior to completing the doctorate, students complete one year of supervised internship training. Graduates are licensed throughout the United States and hold positions of responsibility in mental health clinics, hospitals, medical centers, HMOs, PPOs and independent practice.

Students are expected to be cognizant of various theories of human nature and of various treatment modalities. Students are encouraged to assess the problems of the clients, to select the procedures for behavioral change most appropriate to the problem, to assess the effectiveness of the procedure and, if necessary, to select alternate procedures. Every effort is made to emphasize the value and dignity of psychology as a profession. To this end, the importance of a problem-solving approach, as well as a knowledge of the results of scientific investigations in psychology and the other behavioral sciences, is stressed.

The program is designed with the view that the essence of professional psychology involves process and content. The process is the problem-solving approach and the content involves the knowledge of basic principles and professional skills. Both process and knowledge are in a continuous state of change but this state of change does not negate their significance. The model places greater emphasis on the quality and quantity of professional skills while placing somewhat less emphasis on research. Thus, the practicum and internship experiences are of special importance in our programs.

A combined program in which a student may obtain both the clinical psychology doctorate and a Master of Science in Industrial/Organizational Psychology is available to selected candidates. Interested students should contact the School of Psychology.

Professional Conduct of Students

The university's program in clinical psychology subscribes to the American Psychological Association Code of Ethics and all students are bound by the principles enumerated in that code.

Students who accept admission into the program are subject to the ethics, professional standards and laws relating to psychologists and the practice of psychology. For that reason, they may not engage in any psychological or mental health related work (for pay or otherwise) without the prior written approval of the director of clinical training. To disregard this need for approval or to engage in activities that seem either unethical or inappropriate to their level of training will be cause for dismissal from the program. It is further understood that after graduation they will not engage in the independent or private practice of psychology until licensed or certified by the state in which they would practice.

Licensing/Certification

Licensing/certification laws vary for the various states. Although the curriculum is based on recommendations of the Board of Educational Affairs of the American Psychological Association, and the clinical psychology program is fully accredited by the American Psychological Association's Committee on Accreditation, completion of any program does not ensure admission to the licensing/certification examinations of any state. The applicant or admitted student should obtain and study the laws and regulations pertinent to licensing/certification in the state or states in which they plan to practice and should consider the educational demands on choosing both elective work and internship positions.

Admission Requirements

An applicant must possess a bachelor's degree from an accredited institution of higher learning. Although it is not necessary for the major area to have been psychology, it is expected that those entering without a previous degree in psychology will have completed at least 18 credit hours of psychology course work at the time of application. These courses must have been taken in a department of psychology, and should include statistics, personality theory, abnormal psychology, learning, physiological psychology and social psychology.

All application materials must be received by January 15. Application and application fee should be received by the university prior to receipt of reference letters and transcripts, so the applicant's file can be established. Applications cannot be acted on until all required materials have been received.

All applicants are required to submit:

- the completed graduate school application form, together with the application fee (forms are available from the School of Psychology);
- the School of Psychology's supplemental form (available from the School of Psychology);
- a résumé of professional experience;
- a statement of professional career objectives;
- three letters of recommendation from psychologists familiar with the applicant's academic and/or clinical work, to be mailed directly by the recommenders (forms are available from the School of Psychology);
- official undergraduate and graduate record transcripts, mailed directly from the degree-granting institutions; and
- Graduate Record Examination General Test and Psychology Subject Test results. Please plan to take the GRE early enough to allow test results to be reported by January 15. Results may take up to six weeks to be reported by the Educational Testing Service.

Attendance at the scheduled interview day is recommended but not required. After acceptance, a signed statement that, if admitted, the student will comply with the professional conduct requirements of the School of Psychology must also be submitted.

Degree Requirements

To receive the doctoral degree, the candidate must have been a matriculated student in full-time residence at the school for a minimum of three years (six semesters and two summer terms). This period represents the minimum of attendance to complete the course requirements. In addition to these years of course work, the internship requires an additional year for completion. To obtain an approved internship, students must make application and be accepted at one of the many APA-accredited internship training facilities located throughout the country.

A student admitted to the doctoral program without a master's degree is awarded the master of science degree when the following 36 credits are successfully completed:

PSY	5101 Statistical Research Methods 1	3
PSY	5102 Statistical Research Methods 2	3
PSY	5105 Biological Foundations of Behavior	3
PSY	5120 Culture and Psychology	3
PSY	5501 Personality and Psychotherapy	3
PSY	5502 Psychopathology	3
PSY	5521 Assessment of Intelligence	3
PSY	5522 Laboratory in Assessment of Intelligence	1
PSY	5524 Laboratory in Assessment of Personality	1
PSY	5527 Objective Personality Assessment	3
PSY	5528 Projective Personality Assessment	3
PSY	5591 Seminar in Professional Standards and Ethical Principles in Psychology	1
PSY	5999 Thesis (minimum)	6

The requirements for the master's degree, including the final defense of the thesis, must be completed by the end of the fall semester of the third year. No more than nine credit hours of PSY 5999 may be counted toward the master's or doctoral degree. All requirements for the doctoral degree must be completed no later than seven years from the date of first attendance.

A student who completed graduate work at another accredited university can petition for transfer of a maximum of 18 semester credits. Beyond the 18 credits students can also petition for substitution of elective courses for required courses taken previously. Such requests are normally evaluated by the director of clinical training. Transfers and elective substitutions are not granted for the core clinical specialization courses listed in the curriculum description.

A student receiving a grade of C in a required course may be required to repeat the course and attain a grade of B or better. All grades will enter into the grade point average, but only credit hours from the final repeat will be credited toward the minimum credit hour requirement.

Requirements for the Psy.D. degree include:

1. A minimum of 104 semester hours of credit beyond the bachelor's degree, including the required courses described in the curriculum section below.
2. A minimum of three years of full-time residency: six semesters and two summer terms. Full-time status is defined as nine or more credits. Although the curriculum is arranged to allow for its completion within a three-year time frame, students are encouraged to consider a fourth year of study to take additional electives, practica and specialty tracks.
3. Admission to candidacy requires the successful completion of the following five components:
   a. Clinical qualification examination (CQE). At the completion of 300 clock hours of practica, the clinical faculty of the School of Psychology makes an assessment of student progress in clinical skill development. This CQE contains numerous components including a written conceptualization and treatment plan of the videotaped case and an oral presentation and defense of the case.
   b. Written comprehensive examination. At the end of the second year of study, all students are required to take and pass a written comprehensive examination. The examination includes both in-class and take-home components, and covers the core academic and clinical areas of psychology.
   c. Second year student review. At the end of the second year, the clinical faculty reviews all students across a number of personal and interpersonal dimensions, which are directly tied to their ability to function as professional psychologists.
   d. Completion of a master's thesis or research project.
   e. Satisfactory academic progress. A 3.2 grade point average, computed on the basis of all university course work applied to the doctoral program, is required for admission to candidacy.
4. An internship consisting of 2000 clock hours of supervised experience in an internship facility accredited by the American Psychological Association to offer clinical training. This placement provides the trainee with the opportunity to take substantial responsibility for carrying out the major professional functions with appropriate supervisory support. Liaison between the Office of Clinical Training and the internship facility is maintained.

Curriculum

The curriculum for the doctor of psychology program consists of three or four levels of training, as summarized below.

Basic science, research and assessment course work occupy the early terms of residence and flow into intervention and practicum, work that occupies the later terms of residence.

Level I (Beginning)

This level corresponds to the first year of training following the bachelor's degree. It consists of basic science courses designed to develop a broad conceptual understanding of the theoretical foundations for clinical practice and entry-level assessment and intervention skills. Basic assessment skills are developed and the master's thesis proposal is generated. Students entering with a master's degree begin practicum placements.

Level II (Intermediate)

This level corresponds to the second residence year in the program. Didactic work consists of more advanced examinations of broad-based conceptual foundations, further development of assessment and intervention strategies, and beginning and intermediate practica placements. The master's thesis is completed and defended during this year.

Level III (Advanced)

This level corresponds to the third residence year in the program. Assessment and intervention skills are fine-tuned during this year and are put into practical use in advanced practicum assignments. Systems of case conceptualization are reviewed and related to assessment and intervention strategies.

Level IV (Advanced Specialty)

This level corresponds to the optional fourth year in the program. During this year students may take advantage of our specialty tracks, obtain more field experience in advanced practica and take more electives.

The Doctor of Psychology program includes the following required courses:

Foundations of Psychology

Biological Bases (6 credits)
PSY 5105 Biological Foundations of Behavior 3
PSY 5511 Clinical Psychopharmacology 3

Cognitive/Affective Bases of Behavior (3 credits)
PSY 5104 Learning and Memory 3

Social Bases of Behavior (6 credits)
PSY 5120 Culture and Psychology 3
PSY 5570 Multicultural Psychotherapy 3

Individual Differences (6 credits)
PSY 5502 Psychopathology 3
PSY 5106 Life-Span Development 3
or
PSY 6514 Clinical Aging and Development 3

Research Methods (12–15 credits)
PSY 5101 Statistical Research Methods 1 3
PSY 5102 Statistical Research Methods 2 3
PSY 5999 Thesis (or PSY 5990 Research Project) 6–9

Professional Standards and Ethics (3 credits)
PSY 5591 Seminar in Professional Standards and Ethical Principles 1 1
PSY 5592 Seminar in Professional Standards and Ethical Principles 2 1
PSY 5593 Seminar in Professional Standards and Ethical Principles 3 1

Clinical Specialization

Psychological Assessment (14 credits)
PSY 5521 Assessment of Intelligence .....
PSY 5522 Laboratory in Assessment of Intelligence 1
PSY 5524 Laboratory in Assessment of Personality 1
PSY 5527 Objective Personality Assessment 3
PSY 5528 Projective Personality Assessment 3
PSY 6521 Psychodiagnostics 3

Relationship and Interpersonal Skills (9 credits)
PSY 5541 Clinical Skills and Techniques 1 3
PSY 5542 Clinical Skills and Techniques 2 3

Intervention (12 credits)
PSY 5501 Personality and Psychotherapy 3
PSY 5549 Psychotherapy Techniques 3
PSY 5xxx Approved Intervention Courses* 6

Professional Issues (6 credits from the following)
PSY 5113 Program Evaluation 3
PSY 5506 Administration of Mental Health Services 3
PSY 6580 Consultation 3
PSY 6583 Supervision in Psychotherapy Training 3

Supervised Practical Experience (21–24 credits)
PSY 5000 Clinical Colloquium 0
PSY 5001 Pre-practicum 0
PSY 5595 Practicum 21–24

**A list of approved intervention courses is available upon request.*

Internship (2,000 clock hours)
Students register for nine hours of internship credit (PSY 6595) in each of three semesters. Grading is on a satisfactory/unsatisfactory basis, and credits do not count toward the minimum 104 credit hours of course work necessary for the doctor of psychology degree.

Typical Program Plan

Year 1

FALL (14–17 CREDITS)
PSY 5000 Clinical Colloquium 0
PSY 5001 Pre-practicum 0
PSY 5101 Statistical Research Methods 3
PSY 5501 Personality and Psychotherapy 3
PSY 5521 Assessment of Intelligence 3
PSY 5522 Lab in Assessment of Intelligence 1
PSY 5541 Clinical Skills and Techniques 1 3
PSY 5591 Seminar in Professional Standards and Ethical Principles in Psychology 1 1
Electives 0–3

SPRING (12–17 CREDITS)
PSY 5000 Clinical Colloquium 0
PSY 5001 Pre-practicum 0
PSY 5102 Statistical Research Methods 2 3
PSY 5502 Psychopathology 3
PSY 5527 Objective Personality Assessment 3
PSY 5542 Clinical Skills and Techniques 2 3
PSY 5595 Practicum
Electives

SUMMER (13–17 CREDITS)
PSY 5120 Culture and Psychology 3
PSY 5524 Laboratory in Assessment of Personality 1
PSY 5528 Projective Personality Assessment 3
PSY 5549 Psychotherapy Techniques 3
PSY 5595 Practicum
PSY 5999 Thesis 3

Year 2

FALL (9–17 CREDITS)
PSY 5000 Clinical Colloquium 0
PSY 5595 Practicum
PSY 5999 Thesis 3
PSY 6521 Psychodiagnostics 3
or
PSY 5570 Multicultural Psychotherapy 3
Intervention Elective 3
Electives

SPRING (13–17 CREDITS)
PSY 5000 Clinical Colloquium 0
PSY 5105 Biological Foundations of Behavior 3
PSY 5570 Multicultural Psychotherapy 3
or
PSY 6521 Psychodiagnostics 3
PSY 5592 Seminar in Professional Standards and Ethical Principles in Psychology 2 1
PSY 5595 Practicum
PSY 5999 Thesis 3
Intervention Elective 3
Electives

SUMMER (6–12 CREDITS)
PSY 5104 Learning and Memory 3
or
Intervention Elective 3
PSY 5113 Program Evaluation 3
or
PSY 5506 Administration of Mental Health Services 3
PSY 5595 Practicum
Electives

Year 3

FALL (9–17 CREDITS)
PSY 5000 Clinical Colloquium 0
PSY 5104 Learning and Memory 3
or
Intervention Elective 3
PSY 5106 Life-span Development 3
or
PSY 6514 Aging and Development 3
PSY 5511 Clinical Psychopharmacology 3
PSY 5595 Practicum
Electives

SPRING (10–17 CREDITS)
PSY 5000 Clinical Colloquium 0
PSY 5593 Seminar in Professional Standards and Ethical Principles in Psychology 3 1
PSY 5595 Practicum
PSY 6583 Supervision in Psychotherapy Training 3
or
PSY 6580 Consultation 3
Electives

SUMMER
PSY 5595 Practicum
Electives

Year 4 2,000 Hour Internship

Academic Dismissal

Students will be dismissed from further graduate study under the following circumstances:

- A grade point average below 3.0 at any stage of the doctoral program.
- Two or more grades of D or F.
- Unsatisfactory grades for nine credits of internship.
- Nonadmission to doctoral candidacy as defined under Degree Requirements.
- Failure to abide by the Mental Health practice standards as specified in Policy 3.4.
- Failure to abide by the Ethical Principles of Psychologists and Code of Ethics of the American Psychological Association.
- Hampering the academic efforts of other students.
- Failure to maintain satisfactory progress in course work and/or research, regardless of grade point average.
- Violation of the legal and ethical standards of the university, including, but not limited to, cheating, plagiarism, knowingly furnishing false information to the university, or forging, altering or misusing university documents or academic credentials.
- Failure to demonstrate adequately those personal and interpersonal skills and attributes deemed suitable for the profession, as delineated in the School of Psychology graduate student handbook.

The *Graduate Information and Regulations* section of this catalog presents information concerning dismissal and the rights of the student to appeal dismissal decisions.

The Multicultural Commitment

The School of Psychology is committed to providing students with information and training that is not restricted to one cultural or national tradition. Exposure to information on the theory and practice of psychology in different cultures and with different ethnic and cultural minorities make graduates sensitive to cultural, national and ethnic differences, whether encountered at home or abroad.

Specialty Tracks

The majority of students complete the program without pursuing a specific specialty track. However, specialty tracks have been developed in marriage and family psychology, child psychology, neuropsychology-behavioral medicine and industrial/organizational psychology. Most tracks can be completed within the three years of required residence by selecting the appropriate electives and practicum sites. The industrial/organizational psychology track does require an additional year of residence.

Intensive Classroom Courses

These courses are usually one credit hour and are taught by nationally known members of our visiting and adjunct faculty. The format of an intensive course is as follows. Each registered student is given a syllabus that includes reading and report assignments. Several weeks into the term, the class meets formally with the professor for one, two or three days. Papers or tests can be given during this time, and papers and projects are usually assigned for the remaining weeks of the term. All assignments are due by the end of the semester. This format allows our students to gain exposure to distinguished psychologists from throughout the world. Generally, one of these courses is available each semester.

School of Extended Graduate Studies

Dean Ronald L. Marshall, Ph.D.

Professional Master of Business Administration

Acquisition and Contract Management
eBusiness
Human Resources Management
Information Systems

Master of Public Administration

Master of Science

Acquisition and Contract Management
Aerospace Engineering
Computer Information Systems
Computer Science
Electrical Engineering
Engineering Management
Human Resources Management
Logistics Management
Materiel Acquisition Management
Mechanical Engineering
Operations Research
Project Management
  Information Systems
  Operations Research
Space Systems
Space Systems Management
Systems Management
  Information Systems
  Operations Research

Master of Science in Management

Acquisition and Contract Management
eBusiness
Human Resources Management
Information Systems
Logistics Management
Transportation Management

Directors of Graduate Studies

Aberdeen Graduate Center
Atefeh S. McCampbell, D.B.A.

Fort Lee Graduate Center
Barbara L. Peery, Ph.D.

Hampton Roads Graduate Center
Catherine A. Elder, Ph.D.

National Capital Region Center
Lloyd H. Muller, Ed.D.

Northeast Graduate Center
Richard O. Blalack, D.B.A.

Orlando Graduate Center
David E. Clapp, Ph.D.

Patuxent Graduate Center
Norman W. Chlosta, M.P.A.

Redstone Graduate Center
William C. Wall, Jr., Ph.D.

Virtual Graduate Center
Mary S. Bonhomme, Ph.D.

Professors

Richard O. Blalack, D.B.A., Northeast Graduate Center, *Management*

John F. Clark, Ph.D., P.E., Spaceport Graduate Center, *Space Systems*

Edwin F. Strother, Ph.D., Spaceport Graduate Center, *Space Systems*

Kermit C. Zieg Jr., Ph.D., National Capital Region Graduate Center, *Management*

Associate Professors

David E. Clapp, Ph.D., Orlando Graduate Center, *Management*

Vernon C. Gordon, Ph.D., Patuxent Graduate Center, *Aerospace Engineering*

George W. Masters, Ph.D., Patuxent Graduate Center, *Electrical Engineering*

Atefeh S. McCampbell, Ph.D., Aberdeen Graduate Center, *Management*

Jeffrey C. Mitchell, M.S., Spaceport Graduate Center, *Space Systems*

Barbara L. Peery, Ph.D., Fort Lee Graduate Center, *Management*

Daniel B. Weddle, Ph.D., Patuxent Graduate Center, *Computer Science*

Assistant Professors

Barry A. Bodt, Ph.D., Aberdeen Graduate Center, *Management*

Norman W. Chlosta, M.P.A., Patuxent Graduate Center, *Management*

Catherine A. Elder, Ph.D., Hampton Roads Graduate Center, *Management*

John B. Foulkes, Ph.D., National Capital Region Graduate Center, *Management*

Robert B. Kirby, J.D., Orlando Professional Development Center, *Financial Planning*

Jennifer M. Long, Ph.D., Patuxent Graduate Center, *Electrical Engineering*

Lloyd H. Muller, Ed.D., National Capital Region Graduate Center, *Management*

David W. Mutschler, Ph.D., Patuxent Graduate Center, *Computer Information Systems*

William C. Wall, Jr., Ph.D., Northeast Graduate Center

Professor Emeritus

Arthur L. Holt, Ph.D.

Organization

The School of Extended Graduate Studies offers master's degree programs at 10 graduate centers in five states. The programs are conducted in a traditional manner with admission and graduation standards the same as those required on the main campus.

Inquiries about extended graduate studies programs should be addressed to:
Florida Institute of Technology
Dean, School of Extended Graduate Studies
150 West University Boulevard
Melbourne, FL 32901-6975
(321) 674-8880
Fax (800) 676-9245
www.segs.fit.edu

Degree Programs

The procedures for admission, specific degree requirements and curriculum offerings are published separately in the official catalog for each graduate center. A summary chart of degrees offered by graduate center locations appears at the end of this section. Management courses used to support School of Extended Graduate Studies' master's programs are identified by the prefix MGT. These courses are taught both on the main campus and at the extended graduate centers based upon enrollment demands. A description of the MGT courses appears in the *Course Descriptions* section of this catalog and is published separately in the official catalog for each graduate center.

Distance Learning

The professional M.B.A., and all of the M.S. Management (M.S.M.) programs, are available in a complete online distance learning mode. Visit the Web site at www.segs.fit.edu for current course offerings and enrollment information. Courses may be completed for graduate credit toward a master's degree, or for non-credit continuing education. Also, ten graduate certificate programs are available via online distance learning. A graduate certificate program requires completion of five courses, for a total of 15 graduate credit hours. Enrollment information and further details about the graduate certificate programs may be obtained from any of the ten graduate centers or in the published school catalogs.

Graduate certificate programs currently available online are:

- Business Management
- Contract Management
- eBusiness
- Information Systems Management
- Logistics Management
- Materiel Acquisition Management
- Program Management
- Systems Management
- Quality Management
- Transportation Management

Professional Development Programs

Director
Robert K. Dwyer

The Office of Professional Development offers short courses, seminars, workshops and conferences that address the work-related educational needs of business, government and the professions. Programs are scheduled during business hours, evenings and weekends. The office also custom designs in-house programs to meet the unique training needs of many types of organizations. Programs relating to the financial profession are offered through the financial planning programs.

The office provides professional development continuing education courses and programs in the areas of engineering, business, aeronautics, psychology and the sciences. Continuing education units (CEUs) are given for participation in many programs. Some programs meet the continuing education requirements for various professional associations, state boards and federal government agencies.

Visit us on the Web at www.segs.fit.edu/pdp, for program details including Distance Learning Programs.

Financial Programs

The **Certificate in Financial Planning** program was developed according to the guidelines set and is registered by the Certified Financial Planner Board of Standards Inc. It is designed to expand participants' expertise in the field of financial planning to better serve their clients and to prepare participants for the CFP* Certification Examination.

The objectives of the Certificate in Financial Planning program are to increase public awareness of the CFP certification process and the ethical standards of a CFP, and to promote the professional competency of individuals involved financial planning and those who desire to become Certified Financial Planners. Topics addressed include ethics, risk management, investment planning, tax planning, retirement planning and employee benefits and estate planning.

**CFP and Certified Financial Planner are federally registered service marks of the CFP Board.*

Successful Money Management seminars help the participants to define their financial goals and to achieve them. Maximizing personal income and getting the most from investments, minimizing taxes and allocating assets by using the appropriate plan are covered.

Management Programs

The **Professional Certificate in Project Management** was developed to allow individuals in all sectors (government, profit, not for profit and self-employed) to gain comprehensive project management skills and to apply those skills to diverse projects for successful project management. The program presents the foundation needed to effectively manage projects of all sizes. Courses address the role, responsibility and authority of the project manager and the integration of project functions into organizational structures. Leadership and interpersonal relationships within organizations, as well as program conflict resolution, organizational priorities, contract and procurement management, quality, schedule and cost control, communication and project closure are addressed. Included is a preparation course for the Project Management Institute (PMI)* Certification examination.

**PMI and Project Management Institute are registered trademarks of the Project Management Institute.*

Whether a business is small or large, service or manufacturing, the powerful **Accelerated Six Sigma Expert Training Program** provides participants with proven Six Sigma tools and techniques. Emphasis is on gaining knowledge in all aspects of product and process life cycles. Using several in-class exercises, participants learn applicable tools to prioritize, characterize, and optimize return on investment.

The **Accelerated Problem Solving Workshop** provides hands-on experience with proven statistical tools and techniques that facilitate workplace problem solving. The methods can be applied to any business activity, small or large, production or service. The workshop teaches participants to use data-driven methods to improve cycle time and reduce defects and rework.

Acquisition and Logistician Management Courses

The **Certified Logisticians** course provides a comprehensive review of logistical systems design, development and management, acquisition and production support, and distribution and custom support. The material includes theory, definitions, practice problems and reference materials. The course is intended to prepare participants for the Certified Logistician Examination.

Contract and Acquisition Management Equivalencies may be taken by government and civilian employees to fulfill mandatory training requirements. They may also be taken by industry contract professionals to enhance their knowledge of various aspects of acquisition management.

The **Certified Professional Contract Manager's (CPCM)** course is designed to assist practicing, experienced acquisition managers in preparation for the CPCM examination. It provides a comprehensive review of the material covered by that examination, including general procurement and contracting issues, the legal aspects of procurement, finance/economics/accounting, production management and logistics problems.

Information Technology Programs

Certificate Programs in Information Technologies are designed to provide continuing education and professional development opportunities for individuals interested in increasing their knowledge and skills within the IT fields. The TechTrax certification series is designed to provide a conceptual overview of information technologies, coupled with hands-on hardware and software experience. Taught by industry professionals, the program comprises a series of IT courses that lead to both vendor-neutral (NACSE, CompTia) and vendor-specific (Novell, Microsoft, Cisco) certifications.

The program begins with Core Technologies Certification and Advanced Telecommunications Certification. After completing this introductory track of IT fundamentals, the student may specialize in one or more secondary tracks: Network Administration Certification, MCSE Windows 2000 Certification, Web Site Design Certification and Network Analysis Certification.

The **Computer Networking Certificate** program is an accelerated learning program that requires no prior experience in the computer networking field. It is designed to give the working professional both a conceptual view of the computer networking industry and an in-depth understanding of the technologies used in corporate networks. The program comprises nine modules ranging from basic concepts, such as Local Area Networks (LANs), to more complex subjects, such as Internetworking and Network Design. It also covers software, hands-on training, and preparation for the Florida Institute of Technology Certificate in Computer Networking, NACSE Examination for the NSNS Senior Network Specialist Certification, Microsoft Certified System Engineer (MCSE) Windows 2000, CompTia Network and Certified Network Associate (CCNA) certificates.

The **UNIX System/C Programming Certificate** program provides a comprehensive knowledge of UNIX fundamentals, UNIX shell programming, UNIX system administration and TCP/IP networking. Students then learn to use the C, OOP and C++ programming languages within the UNIX environment. The four C modules progress from an introduction to the structure and syntax of the C language through the sophisticated applications required in multi-user systems.

The **Oracle8 Database Administration Certificate** program provides a thorough knowledge of the tasks, skills and abilities necessary to successfully administer an Oracle8 Database System, including SQL and PL/SQL, database administration, backup and recovery, performance tuning and Oracle network administration.

The **Oracle Application Developer Certificate** program covers use of the Oracle database using SQL and PL/SQL, as well as development of Oracle forms and reports with Oracle development tools such as Oracle Developer 2000, and preparation for the Oracle Certified Professional (OCP) Application Developer examinations administered through Sylvan Prometric testing centers.

The **Microsoft Certified Solution Developer** program covers Microsoft programming software, tools and methods, and the series of Microsoft Certified Solution Developer (MCSD) examinations.

The **Telecommunications Analysis Certificate** program covers important telecommunications concepts, methods and terminology, using a variety of conceptual, theoretical and hands-on exercises. The concepts and technologies of Wide Area Networking are presented including Frame Relay, TI and ATM. Data communications, voice communications and their integration are covered. Strategic telecom solutions are devised and discussed. The program also prepares students for the National Association of Communication Systems Engineers (NACSE) Associate Network Specialist (NANS) and Telecommunications Technician 1 (NTT1) examinations and certification.

The **Java UNIX and LINUX Programming Certificates** program provides a comprehensive knowledge of the LINUX operating system environment. Through hands-on work students learn LINUX fundamentals, LINUX shell programming, LINUX system administration, TCP/IP networking, and the use of the Java programming language in the LINUX environment.

The **Webmaster Certificate** program teaches the concepts and effective use of the Internet, Web technology and tools, vendor-neutral and vendor-specific hardware and software, hands-on training, and certificate preparation for the NACSE Associate Network Specialist (NANS), NACSE Certified Webmaster (NCW), CompTIA Network +, and Microsoft Certified Professional (MCP) certification in Frontpage 2000. Graduates receive a Florida Institute of Technology Certificate.

The **A+ Certificate** program covers installing, troubleshooting, upgrading and repairing computer hardware and systems, and prepares students for CompTIA's two A+ Certification examinations.

Acquisition and Contract Management

Master of Science

The Master of Science program in Acquisition and Contract Management is designed for adult working professionals in the public and private sectors of acquisition and contract management. The curriculum provides coverage of federal procurement practices, current issues in contracting and contract administration, legal and financial aspects of government contracting and policy issues associated with acquisition and contract management. Individuals without current experience in acquisition and contract management may be accepted into this program; however, all program prerequisite courses must be fulfilled.

Admission Requirements

The applicant to the Master of Science in Acquisition and Contract Management program must have a bachelor's degree; however, the degree need not be in business administration. Students with undergraduate business degrees or courses may be able to waive the program prerequisites based on evaluations of their undergraduate academic transcripts.

The Graduate Record Examination (GRE) or Graduate Management Admissions Test (GMAT) may be required for admission evaluation purposes. General admission requirements and the process for applying are discussed in the *Graduate Information and Regulations* section of this catalog.

Degree Requirements

The degree of Master of Science in Acquisition and Contract Management is conferred upon students who have successfully completed 33 credit hours of graduate course work plus other course requirements as listed on the student's approved Graduate Program Plan. Students without adequate undergraduate business courses are required to complete the program prerequisites.

Program Prerequisites (2 courses)

MGT 5000 Financial Accounting 3
MGT 5132 Basic Economics 3

In addition, computer literacy is required as a prerequisite. It can be demonstrated by 1) the applicant's undergraduate course work or 2) passing a proficiency examination offered by the School of Extended Graduate Studies or 3) completing a suitable computer course.

Required Courses (9 courses)

MGT 5001 Managerial Accounting 3
MGT 5002 Corporate Finance 3
MGT 5013 Organizational Behavior 3
MGT 5211 Procurement and Contract Management 3
MGT 5213 Contract Changes, Terminations and Disputes 3
MGT 5214 Cost Principles, Effectiveness and Control 3
MGT 5217 Contract and Subcontract Formulation 3
MGT 5218 Contract Negotiations and Incentive Contracts 3
MGT 5220 Contract Management Research Seminar 3

Electives (2 courses)

MGT 5017 Program Management 3
MGT 5023 Management and Administration of Contracts 3
MGT 5064 Cost and Economic Analysis 3
MGT 5084 Materiel Acquisition Management 3
MGT 5138 Business Ethics 3
MGT 5231 Government Contract Law 3
MGT 5240 Business and Legal Aspects of Intellectual Property 3
MGT 5270 Special Topics in Contracts Management 3

TOTAL CREDITS REQUIRED 33

Electives may be taken with the approval of both the faculty adviser and the program head from other graduate-level offerings in the School of Extended Graduate Studies, or other schools or academic units.

SEGS Programs and Locations

Note: For DL = Distance Learning Program Information visit our Web site www. segs.fit.edu

Legend: R = Resident Classes, On site; DL = Distance Learning (Online) Classes

DEGREES OFFERED	LOCATIONS									
	Aberdeen Proving Ground, MD	Fort Lee, VA	Hampton Roads, Fort Eustis/ Norfolk, VA	NCR, Alexandria, VA	Northeast NJ/PA	Orlando, FL	Patuxent River, MD	Redstone Arsenal, AL	Spaceport/ PAFB, FL KSC, FL	Virtual Center
PROFESSIONAL MASTER OF BUSINESS ADMINISTRATION (PMBA)	R-DL	DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL	DL
Acquisition and Contract Management	R-DL	DL	DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL	DL
eBusiness	R-DL	DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL	DL
Human Resources Management	R-DL	DL	DL	DL	R-DL	R-DL	R-DL	R-DL	DL	DL
Information Systems	R-DL	DL	DL	DL	R-DL	R-DL	R-DL	R-DL	DL	DL
MASTER OF PUBLIC ADMINISTRATION (MPA)	DL	DL	DL	DL	R-DL	DL	R-DL	R-DL	DL	DL
MASTER OF SCIENCE (MS)										
ACQUISITION AND CONTRACT MANAGEMENT	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL
AEROSPACE ENGINEERING							R			
COMPUTER INFORMATION SYSTEMS						R	R	R	R	
COMPUTER SCIENCE						R	R		R	
ELECTRICAL ENGINEERING						R	R			
ENGINEERING MANAGEMENT	R				R	R	R	R	R	
HEALTH MANAGEMENT	DL	DL	DL	DL	R-DL	R-DL	DL	DL	DL	DL
HUMAN RESOURCES MANAGEMENT	R-DL	DL	DL	DL	R-DL	R-DL	R-DL	R-DL	DL	DL
LOGISTICS MANAGEMENT	DL	R-DL	DL	DL	R-DL	DL	DL	R-DL	DL	DL
MANAGEMENT	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL
Acquisition and Contract Management	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL
eBusiness	R-DL	DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL
Health Services Management	DL	DL	R-DL	DL	R-DL	R-DL	DL	DL	DL	DL
Human Resources Management	DL	DL	R-DL	DL	R-DL	R-DL	R-DL	R-DL	DL	DL
Information Systems	R-DL	R-DL	DL	DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL
Logistics Management	R-DL	R-DL	R-DL	R-DL	R-DL	DL	DL	R-DL	DL	DL
Transportation Management	DL	DL	R-DL	DL	R-DL	DL	DL	DL	DL	DL
MATERIEL ACQUISITION MANAGEMENT	DL	R-DL	DL	R-DL	R-DL	DL	DL	R-DL	DL	DL
MECHANICAL ENGINEERING							R			
OPERATIONS RESEARCH	R-DL	R-DL	DL	DL	DL	DL	DL	DL	DL	DL
PROJECT MANAGEMENT	R-DL	DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL
Information Systems	R-DL	DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	R-DL	DL
Operations Research	R-DL	DL	DL	DL	R-DL	R-DL	R-DL	R-DL	DL	DL
SOFTWARE ENGINEERING									R	
SPACE SYSTEMS									R	
SPACE SYSTEMS MANAGEMENT									R	

Nondegree Programs

General Studies

Freshman Year Curriculum

The general studies program provides a common freshman-year curriculum for students planning to major in communication, humanities, psychology or business, but are uncertain about which major to choose. Courses representative of these majors are taken during the freshman year, allowing students to obtain a general understanding of each area of study. All courses listed below are applicable toward degrees in all of these majors.

Students are encouraged to choose a degree program prior to registering for the third semester of full-time course work, and must do so within the first 45 credit hours. These criteria are adjusted for transfer students. General studies' students are advised by faculty in each of the programs noted above, and are assigned a new adviser in the appropriate academic unit when they choose a degree program. No degree is awarded in general studies.

Nondegree freshman-year programs in general engineering and general science are also offered, and are described in the corresponding sections of this catalog.

Admission

Criteria for admission are based on those established for the majors listed above. Details are provided in the sections of this catalog that describe these majors. Transfer students with more than 45 credit hours are normally required to choose a degree program other than general studies prior to admission.

Admission to the general studies curriculum allows the student to select any of the participating degree programs at any time prior to completion of 45 credit hours, unless the student has been academically dismissed. No additional admission procedures are required to declare a degree program, except for processing a Change of Major form (available from the Office of the Registrar).

Freshman Year

FALL			CREDITS
BUS	1701	Introduction to Business	3
COM	1101	Composition and Rhetoric	3
EDS	1031	Survey of Science 1	3
MTH	1701	College Algebra	3
PSY	1400	Freshman Seminar	1
PSY	1411	Introduction to Psychology	3
			16

SPRING			
BUS	1401	Personal Finance and Investments	3
COM	1102	Writing About Literature	3
EDS	1032	Survey of Science 2	3
MTH	1702	Applied Calculus	3
PSY	1462	Substance Abuse	3
			15

Languages and Linguistics

Department Head
Nabil I. Matar, Ph.D.

Division Chair
Randall L. Alford, Ph.D.

Associate Professor
Randall L. Alford, Ph.D., *general linguistics, language education, German (generalist), English as a second language.*

Assistant Professor
Peter-Otto Uhr, Ph.D., *foreign languages, literature, history.*

Professor Emerita
Grace S. Wylie, M.A.

Instructors
P. Bernard, M.S.; A. Burkhart, M.A.; C.A. Gibbons, M.A.; D. Russell, M.S.

Organization

Florida Tech's Division of Languages and Linguistics is operated by the Department of Humanities and Communication. It provides training in English for students whose first language is not English and who have been admitted into a Florida Tech degree program.

For all academic students (foreign or native-born) whose first language is not English and whose command of the English language is insufficient to meet the requirements of their academic programs, English courses at two levels of advanced proficiency are available each semester. These courses are listed in the *Course Descriptions* section of this catalog under "English as a Second Language (ESL)." An institutional TOEFL, given at the beginning of each semester as a placement instrument, permits the division's staff to determine the incoming student's competence in English and establish the most beneficial program of study. Both undergraduate and graduate international students who score below 450 on the institutional TOEFL are referred to the ELS Center on campus where lower-level English as a Second Language courses are taught. Students with scores from 450 through 549 are required to take ESL courses as specified by the Division of Languages and Linguistics.

Students are permitted to begin their academic course work in conjunction with ESL 3xxx and 4xxx courses. Although these courses are credit bearing (3 credit hours per course), they cannot be applied toward completion of a degree.

Students who are not native speakers of English are considered to have demonstrated English language proficiency if they have done any of the following:

- taken a TOEFL and earned an official score of at least 550, or a computer-based TOEFL-CBT score of at least 213, no more than two years before the planned date of first attendance at Florida Tech; or
- successfully completed ELS 109 taken at an ELS Language Center, either at Florida Tech or elsewhere, and successfully completed LNE 1040 and LNE 1050 at Florida Tech concurrently with the beginning of their academic courses; or
- successfully completed a total of 20 semester hours at an accredited, mainland U.S. university or college where English is the language of instruction, including three semester hours of English that qualify as transfer credit for Florida Tech's COM 1101 Composition and Rhetoric course; or
- earned a bachelor's or higher degree from an accredited, mainland U.S. university or college where English is the language of instruction; or
- attended for three consecutive years, and graduated from, an accredited, mainland U.S. high school where English is the language of instruction; or
- obtained an official score of 4 or higher on either the International Baccalaureate Higher Level Language A examination in English, or the College Board Advanced Placement Program (AP) examination in English Language and Composition.

Military Science

The mission of the Army Reserve Officers' Training Corps (ROTC) is to commission the future officer leadership of the United States Army. Through Army ROTC, a student can earn a commission as a second lieutenant in the active Army, Army Reserve or Army National Guard. The program is open to both male and female full-time students enrolled in four-year baccalaureate degree programs.

The Army ROTC program at Florida Tech is a general military science curriculum. Instruction covers military fundamentals common to all branches of the service. The program of instruction is designed to complement the student's academic goals of acquiring a baccalaureate degree in a course of study of his or her own choosing. The curriculum stresses leadership development and management principles. Emphasis is placed on the development of leadership traits and skills that are essential to the student's success in the Army, or as a civilian in his or her chosen profession. As such, the ROTC program of instruction cuts across conventional subject boundaries and involves elements of various disciplines that are designed to encourage students to interrelate their learning and to apply that knowledge in reflective thinking, goal seeking and problem solving.

The program is divided into the basic course (Military Science 1 and 2) and the advanced course (Military Science 3 and 4). All military science course grades are included in the student's grade point average. A student wishing to use a military science course to satisfy a degree requirement should consult the "Course Substitutions Authorized for ROTC" section on the following page.

Florida Tech offers both four-year and two-year ROTC programs. The two-year program is particularly beneficial for students who have transferred to Florida Tech from junior colleges where military science training was not available. Such students are required to complete a basic ROTC course at the five-week Army National Leaders Training Course at Ft. Knox, Kentucky. Students may then be enrolled in the advanced course. While attending Camp Challenge, a student receives approximately $700 plus travel expenses to and from camp.

The four-year military science curriculum described below is applicable to both male and female students who meet the required age and physical standards. Students with prior military service or students who were enrolled in a high school ROTC program may be eligible to receive credit for the basic course (MSC 1 and 2) and directly enter the advanced program, as determined by the professor of military science.

Army ROTC Scholarships

The Army ROTC program awards four-, three- and two-year merit-based scholarships to qualified applicants on a competitive basis. These scholarships are offered at a monetary level of $17,000 annually, providing for college tuition and educational fees. An additional scholarship benefit is a designated book allowance. Army scholarship winners and all advanced course cadets receive a tax-free subsistence allowance ranging from $250–350 a month for up to ten months for each year the scholarship is in effect. Scholarships do not pay flight fees.

A student who enrolls at Florida Tech under contract with the U.S. Army as an ROTC scholarship student receives incentives from the university in addition to the benefits paid by the Army. Four-year scholarship winners receive a room and board scholarship from the university and a grant for tuition not covered by the Army. Three-year advanced designees receive 50 percent tuition assistance for the freshman year. Beginning in the sophomore year, three-year advanced designees receive a room and board scholarship, plus tuition balance not covered by the ROTC scholarship from the university. Three- and two-year on-campus scholarship recipients will receive incentive packages similar to the above for all years the scholarship is in effect.

A student who transfers from another university to Florida Tech may be eligible for these incentive benefits as determined on a case-by-case basis by the professor of military science.

Military Science Curriculum

Military Science 1 covers the history, mission and organization of ROTC and the U.S. Army; basic customs, marksmanship, navigation and small-unit infantry tactics; and leadership development through practical exercises. Academic classes meet one hour per week. Leadership laboratory meets 1.5 hours per week. ROTC credit, four hours (2 hr./sem.). Optional activities: Ranger Company, Drill Team, Color Guard, weekend field exercises and physical training (mandatory for scholarship winners).

Military Science 2 offers a more advanced study of map reading and small-unit infantry tactics, and continued leadership development by placement in leader positions within the cadet organization. Academic classes meet two hours per week. Leadership laboratory meets 1.5 hours per week. ROTC credit, two hours/semester. Optional activities: Ranger Company, Color Guard, Drill Team, additional weekend field exercises and physical training (mandatory for scholarship winners).

Military Science 3 covers operation orders and platoon tactics; weapons, land navigation, military skills, communications, instructional techniques; and the development of leadership through tactical exercises. Academic classes meet three hours per week. Leadership laboratory meets 1.5 hours per week. Additionally, there are an average of three mandatory field exercises during the school year. ROTC credit, six hours (3 hrs./sem.). Optional activities: Ranger Company and Drill Team. Physical training attendance is required.

Military Science 4 covers the conduct of training, ethics, military law and history. MSC 4002 is devoted entirely to the study of military history. Cadet leaders gain practical experience in staff organization and planning while executing the unit's training program. Academic classes meet three hours per week. Leadership laboratory meets 1.5 hours per week and physical training meets 3 hours per week (attendance required). Additionally, there are an average of five mandatory field exercises during the school year. ROTC credit, six hours (3 hrs./sem.). Optional activities: Ranger Company and Drill Team.

Course Substitutions Authorized for ROTC

Academic credit is permitted for military science classes as follows.

Aeronautical Science

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free Electives	6
	9

Aeronautical Science Flight Option

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free Elective	3
	6

Applied Mathematics

MSC 4002 Military Science (for Liberal Arts Elective)	3
Free Electives	6
Technical Elective	3
	12

Aviation Computer Science

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free Elective	6
	9

Aviation Management Flight Option and Aviation Management

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free Electives	0–3
	3–6

Aviation Meteorology Flight Option and Aviation Meteorology

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3

Biochemistry and Biological Sciences

MSC 4002 Military Science (for Humanities/ Social Science elective)	3
Liberal Arts Electives	3–6
Free Elective	3
	9–12

Business (except Information Systems)

MSC 4002 Military Science (for Humanities/ Social Science elective)	3
Business Restricted Electives	6
	9

Chemistry

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free Elective	3
Technical Electives	3–6
	9–12

Communication and Humanities

Substitute any three MSC credits for HUM 3385	3
Free Electives	12
	15

Computer Science (except Information Systems)

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free Electives	4
	7

Engineering Programs and Oceanography

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free Elective	3
	6

Environmental Sciences

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free or Restricted Elective	3
	6

Information Systems Options in Business and Computer Sciences

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3

Interdisciplinary Science

Free Electives	6
Interdisciplinary Science	9
	15

Physics

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free Elective	0–12
Technical Elective	3
	6–18

Psychology

Free Electives	17–18

Science and Mathematics Education

Free Elective	3
Liberal Arts Elective	0–3
	3–6

Space Sciences

MSC 4002 Military Science (for Humanities/ Social Science Elective)	3
Free Electives	6
Technical Elective	3
	12

Research: Institutes, Centers and Major Laboratories

Florida Institute of Technology continuously makes major additions and improvements to facilities that enhance the research component of nearly all aspects of undergraduate and graduate education. Along with these facility improvements, a number of research centers have been established to focus on particular areas of study and in many cases encourage interdisciplinary collaboration. These centers, and the facilities where they are located, represent a significant research capability that supplements the various department- and program-related activities and facilities described in previous sections of this catalog.

Particularly noteworthy is the multidisciplinary Applied Research Laboratory (ARL) facility that is situated a few miles from the main campus. ARL houses research in ocean engineering, advanced materials, polymer flammability, lasers and electrooptics, psychology, parallel computing, neural networks and software engineering.

In addition, two new teaching/research buildings were completed in the fall of 1999 on the main campus: the F.W. Olin Engineering Complex and the F.W. Olin Life Sciences Building. The engineering complex is a 68,500-square-foot facility housing 26 specialized research laboratories. The 37,000-square-foot life sciences building houses 12 research laboratories designed with a flex-space to meet the needs of specific activities.

The university engages in more than $8 million in research annually in its six colleges and schools. At any given time, the research faculty have almost $10 million in pending proposals to government agencies and private corporations.

Brief descriptions of Florida Tech's research centers and institutes follow. Not included here is research within the various degree-granting academic units, described in the preceding sections of this catalog.

Oak Ridge Associated Universities (ORAU)

Since 1989, students and faculty of Florida Tech have benefited from its membership in Oak Ridge Associated Universities. ORAU is a consortium of 87 colleges and universities and a management and operating contractor for the U.S. Department of Energy (DOE) located in Oak Ridge, Tenn. ORAU works with its member institutions to help their students and faculty gain access to federal research facilities throughout the country; to keep its members informed about opportunities for fellowship, scholarship and research appointments; and to organize research alliances among its members.

Through the Oak Ridge Institute for Science and Education, the DOE facility that ORAU manages, undergraduates, graduates, postgraduates, as well as faculty enjoy access to a multitude of opportunities for study and research. Students can participate in programs covering a wide variety of disciplines including business, earth sciences, epidemiology, engineering, physics, geological sciences, pharmacology, ocean sciences, biomedical sciences, nuclear chemistry and mathematics. Appointment and program length range from one month to four years. Many of these programs are especially designed to increase the numbers of underrepresented minority students pursuing degrees in science- and engineering-related disciplines. A comprehensive listing of these programs and other opportunities, their disciplines and details on locations and benefits can be found in the Resource Guide, which is available online at www.orau.gov/orise/resgd/htm, or by calling either of the contacts below.

ORAU's Office of Partnership Development seeks opportunities for partnerships and alliances among ORAU's members, private industry and major federal facilities. Activities include faculty development programs, such as the Junior Faculty Enhancement Awards, the Visiting Industrial Scientist Program and various services to chief research officers.

For more information about ORAU and its programs, contact Dr. Robert L. Sullivan, ORAU Council member, at (321) 674-8960; or Monnie E. Champion, ORAU Corporate Secretary, at (423) 576-3306; or online at www.orau.gov.

Aquaculture Laboratory

Director
Junda Lin, Ph.D., Professor, Biological Sciences

The indoor aquaculture facilities at Florida Tech's main campus total approximately 2,500 square feet, most of which is wet laboratory space. Recirculating systems ranging from small glass aquaria through 720-gallon tanks harbor a wide variety of aquatic species. Controlled environmental factors such as temperature, salinity and photoperiod can be imposed on any of these systems, providing outstanding capabilities for studies of reproduction, early life history, growout, nutrition, behavior and related areas of virtually any aquatic species. A phytoplankton and live food culture system is available for nutritional support for planktivorous organisms.

Support equipment for providing aeration, refrigeration, filtration, water quality testing and particle counting is available.

Bioenergy and Technology Laboratory

Director
John J. Thomas, Ph.D., Research Professor, Biological Sciences

Laboratory research is concerned with investigations of biomass-derived hydrogen sulfide, methane and hydrogen, principally from municipal landfills and sewage treatment plants. Performance and emission characteristics of liquid fuels derived from hydrogen and methane are also studied. The laboratory is equipped with advanced engine analysis equipment, including a computerized state-of-the-art dynamometer, 168-square-foot cold cell, exhaust analyzer and many engine performance measuring devices.

Center for Airport Management and Development (CAMD)

Director
Ballard M. Barker, Ph.D., A.A.E.,
Associate Dean, School of Aeronautics

CAMD conducts applied research, contractual consultation and specialized training for industry and governmental organizations in airport planning, design, development, operations, management and system performance. The center includes dedicated computer applications laboratories for supporting the full scope of design, planning, modeling and management activities. It draws upon the specific and multidisciplinary strengths of university faculty and graduate students in airport management and development. Recent major activities have included training development, management training, airport system studies and automated airport planning technology sponsored by The Boeing Company, the Federal Aviation Administration and the Florida Department of Transportation.

Center for Applied Business Research

Director
Dudley Gordon, M.S., Director of Industry Education Programs,
School of Management

This center serves to consolidate the School of Management programs that interact directly with local business, to provide focus and establish responsibility and accountability for activities and relationships with local businesses, to establish a forum for local businesses to interact with the School of Management, to establish and maintain a database of activities involving local businesses for tracking and research purposes, and to support faculty research activities.

Working in close cooperation with the School of Management faculty, the center oversees the following programs: the Local Business Assistance Program, which offers research assistance to businesses (both for-profit and not-for-profit) in marketing, finance, organizational behavior and general management; Internship Practicum Program; Mentor Program; Classroom Guest Speaker Program; Industry Visitation Program; and Faculty Externship Program. The center also maintains a repository of longitudinal data for business research and analysis.

Students are involved in all aspects of the center's activities and have significant opportunities for experiential learning as a result of their interaction with local businesses and professional organizations.

Center for Distance Learning

Director
Mary S. Bonhomme, Ph.D.

This center is the focus for the identification, development and marketing of courses and programs (undergraduate, graduate, and professional development) for delivery using distance learning technologies. Primary functions of the center include administering the learning management system and providing assistance to faculty using the learning management system for distance education. The center's staff informs the faculty of requests by outside audiences for courses and programs, works with the staff of Instructional Technology to provide the pedagogy and technology to ensure their high-quality presentation, and works with the faculty to implement marketing plans. Through its advisory board, the center's staff works with faculty to develop and promulgate policies and procedures to assure the excellence and continued improvement of Florida Tech's distance learning programs, monitor advances in educational delivery technology, and investigate new approaches with the goal of continuously improving the effectiveness of the distance learning experience.

Center for Environmental Education

Co-Directors
Robert Fronk, Ph.D., Professor and Head, Science Education

Thomas Marcinkowski, Ph.D., Acopian Associate Professor
of Environmental Education

Founded in 1993, this center supports ongoing activities in teacher education and professional development opportunities; regional, national and international outreach; curriculum, program and educational materials development; and research, assessment and evaluation. Recent projects include validation and subsequent use of the Secondary School Environmental Literacy Instrument; development and field testing of the Everglades Case Study and development of an accompanying Teachers Guide and Web site; development and piloting of an electronic survey and database on the nature and performance of multigrade environmental programs in K–12 schools; and involvement in Florida Tech's Peace Corps Fellows Program. Research, assessment and evaluation activities address three prominent needs: organization, synthesis, interpretation and application of research studies in environmental education at national and state levels; development of sound assessment and evaluation strategies for use in environmental education; and assisting professionals in the field to apply these strategies to their own and others' programs.

Center for Information Assurance

Director
Joseph C. Wheeler, Ph.D., Professor and Head,
Electrical and Computer Engineering

The center is funded by both industry and government sponsors and concentrates on all aspects of computer hardware and software security. Faculty participants are internationally recognized for their technical contributions, especially in the areas of hardware and software security testing. License agreements in place with a number of industry leaders enable the implementation of research results in commercial quality hardware and software products, focusing on assuring the integrity of computer hardware and

software applications from malicious intrusion. The center performs funded hardware and software testing, vulnerability testing, security assessments and basic research in computer security and software development testing.

Center for Remote Sensing

Director
Charles R. Bostater, Ph.D., Associate Professor,
Environmental Sciences and Physical Oceanography

The center's purpose is to encourage excellence in the development and application of remote sensing technology. It is structured as a joint effort among the College of Engineering, the College of Science and Liberal Arts and the School of Aeronautics. Under the authority of the Space Grant Act of 1988, Florida Tech is a member of the Southeastern Space Consortium and the Florida Space Grant Colleges Consortium. Accordingly, the center is not only an interdisciplinary facility within the university, but also is allied with local industry; government agencies such as the NASA Kennedy Space Center, the Air Force's 45th Weather Squadron, the NOAA National Weather Service and the Florida Solar Energy Center; and other institutions.

Facilities for remote sensing teaching and research include the ERDAS Image Analysis System, the Evans Library, the Geographical Information Systems Laboratory, the Marine and Environmental Optics Laboratory and the Synoptic Meteorological Laboratory. Various laboratories and facilities in academic and research computing; computer science; aerospace, computer, electrical and mechanical engineering; physics and space sciences; and space systems are also available. Field studies can be conducted through the School of Aeronautics' fleet of aircraft, the flotilla of small watercraft at Florida Tech's Evinrude Marine Operations Center and the R/V *Delphinus* (the university's 20-meter research vessel).

Center faculty offer a wide variety of courses at the graduate and undergraduate level, including Environmental Satellite Systems and Data, Hydroacoustics, Digital Image Processing and Environmental Optics for Remote Sensing.

Claude Pepper Institute for Aging and Therapeutic Research

Director
Joshua Rokach, Ph.D., Professor, Chemistry

The institute is interested in improving the understanding of some of the most serious and yet misunderstood diseases such as arthritis, atherosclerosis and Alzheimer's Disease.

A fundamental premise of the institute's work is that free radical oxidative processes play an important role in these chronic degenerative diseases. The free radical oxidative process initiates a reaction with polyunsaturated fatty acids on cell membranes to produce a family of products called isoprostanes. These isoprostanes are therefore the products of oxidative cellular damage and can also cause distortions of the membranes leading to cell death. Knowledge of the amounts of isoprostanes formed may give us an indication of the severity of oxidative damage in degenerative diseases.

The institute's focus is on the chemistry of these isoprostanes and it has started a program for the total synthesis of some of them. Institute researchers have used these synthetic standards to develop sensitive assays to measure the isoprostanes in biological fluids such as urine, blood, etc. The level of these compounds in patients with atherosclerosis, for example, have been found to be highly elevated, implying oxidative damage to the coronary artery.

The Claude Pepper Institute for Aging and Therapeutic Research provides training and educational opportunities in chemical, biochemical and bioanalytical areas for students who want careers in industrial or academic settings.

Dynamic Systems and Controls Laboratory (DSC)

Co-Directors
Hector Gutierrez, Ph.D., P.E., Assistant Professor,
Mechanical Engineering

Y.I. Sharaf-Eldeen, Ph.D., P.E., Associate Professor,
Mechanical Engineering

DSC supports a variety of research and teaching activities in dynamic systems, including machinery monitoring and fault diagnosis, real-time control, computer-based instrumentation and mechatronics. Current research activities include real-time, on-line vibration and angular motion measurements and analyses to develop condition monitoring and maintenance information systems for power generation and transmission systems and components in rotating machinery; frequency response of model structures to low frequency (earthquake) vibrations; and system identification of magnetic suspension systems for a range of gaps and dynamic conditions. State-of-the-art sensors and data acquisition systems are utilized in remote, wireless monitoring and control applications using the Internet.

Real-time control and mechatronics activities include nonlinear control of magnetic suspension systems focused on high-precision positioning applications; hybrid control of seismically-excited nonlinear buildings using distributed tuned mass dampers; vision-based automated alignment by hybrid video and video-Moire techniques; micro-processor based control systems such as small mobile robots and robot arms; and automation projects.

A 2-D magnetically levitated machine for semiconductor manufacturing is being developed with National Science Foundation support.

Geospace Physics Laboratory (GPL)

Director
Hamid K. Rassoul, Ph.D., Associate Professor,
Physics and Space Sciences

The laboratory hosts the space physics research activities of Florida Tech's space sciences program. Space physicists, graduate and undergraduate students study the interaction of the Sun on Earth's magnetosphere and ionosphere, as manifested in such phenomena as the aurora. Current research projects include the study of plasma wave activity within the magnetosphere, solar/interplanetary energetic particle measurements, and cosmic-ray propagation modeling. GPL operates a 10-site meridional array of magnetometers along the east coast of the United States (the MEASURE array). The array observations, and particle and field measurements from various satellites (CRRES, LANL, IMP) are used for studying magnetic wave energy propagation within the geospace environment and the dynamics of Earth's

plasmasphere and the storm-time radiation belt. Research at GPL also includes the study of energetic particle acceleration and propagation within the heliosphere and in interstellar space, using energetic particle measurements from the Ulysses, ACE, Wind and CRRES spacecraft as well as numerical modeling of particle transport processes. A space shuttle Get Away Special Canister (GAS Can) payload to study upward propagating lightning from space is being developed with a student team in charge of the hardware assembly and integration of the radio, optical and gamma ray experiments. Please see www.pss.fit.edu/Space-Physics/gpl.html for more details.

Infectious Diseases Laboratory

Director
Arvind M. Dhople, Ph.D., Research Professor, Biological Sciences

Current research in this laboratory is aimed at the successful *in vitro* growth of *Mycobacterium leprae*, the causative agent of human leprosy. Partial success in this area has led to a model for *in vitro* screening of potential anti-leprosy drugs and evaluation of potential compounds for their *in vitro* and *in vivo* (mice) activities against *M. leprae*.

The techniques developed and knowledge gained from the lab's previous and ongoing studies are being extended to identify new drugs against human tuberculosis, and also to develop new methods to determine compliance of tuberculosis patients to chemotherapy. Similar studies are being carried out with *Mycobacterium ulcerans* infection (Buruli ulcer), which is rapidly becoming prevalent in many African countries. Drug evaluation studies with three bacteria are being carried out in collaboration with pharmaceutical companies in the U.S. and Japan.

This laboratory is also working in some areas of food microbiology, especially on prevention of food contamination with *Escherichia coli O157:H7*, a causative agent of enterohemorrhagic gastroenteritis, which is also becoming more and more prevalent worldwide, and has undertaken a study of the role of Chlamydia pneumonia and smoking in the pathogenesis of atherosclerosis.

Joint Center for Advanced Therapeutics and Research

Director
Mary Beth Kenkel, Ph.D., Professor and Dean, School of Psychology

The Holmes Regional Medical Center/Florida Tech Joint Center for Advanced Therapeutics and Research was created to encourage interdisciplinary clinical, scientific and engineering research to foster the development and application of novel diagnostic and therapeutic methods in medicine otherwise unobtainable in each institution individually. The center provides a means by which the faculty of Florida Tech and the medical staff of Holmes Regional Medical Center/Health First (HRMC) have mutual access to the facilities and services of each institution for the purpose of both basic and clinical research. The Joint Center also houses the East Central Florida Memory Disorder Clinic, administered by HRMC. The Memory Disorder Clinic provides a variety of services to patients and their families.

Laser, Optics and Instrumentation Laboratory (LOI)

Co-Directors
Kunal Mitra, Ph.D., Associate Professor, Mechanical Engineering

Chelakara Subramanian, Ph.D., P.Eng, Associate Professor, Aerospace Engineering

LOI exploits current technologies in continuous wave and short-pulse lasers and optics to develop new techniques for measuring and characterizing material properties. Faculty and graduate students are involved in analyzing the interaction of short-pulse and continuous wave lasers with different materials for biomedical, material characterization and processing, and remote sensing applications that require integration of laser sources, system optics, instrumentation, measurement schemes and data acquisition.

Maglev Laboratory

Director
Laszlo Baksay, Ph.D., Professor and Head, Physics and Space Sciences

The maglev facility at Florida Tech is a new cooperation with NASA, the Florida Space Institutes, and the Advanced Magnet Laboratory, a high-tech industry partner. It houses a 43-foot magnetic levitation and propulsion demonstration track, one of a handful of such devices in the country, and the only one at an academic institution. Physics, space science and engineering students and faculty, together with researchers from the other institutions, are performing investigations in topics such as controls, aerodynamics, mechanical stability, superconducting technology and electromagnetic acceleration and levitation, to study the feasibility of maglev launch assist for future spacecaraft.

Some of the work is also related to maglev based transportation systems. The laboratory also houses a 20-foot maglev track model built by Florida Tech students.

Microelectronics Laboratory

Director
Thomas J. Sanders, Ph.D., Harris Professor,
Electrical and Computer Engineering

This microelectronics facility is designed to be a teaching laboratory, as well as an advanced research laboratory. A microelectronics fabrication course is taught to graduate and undergraduate students. In this course, students complete, fabricate and test state-of-the-art integrated circuits. Research conducted in the facility includes advanced microelectronic packaging and processes for new metalization techniques and dielectrics.

The facility is a 3,800-square-foot structure with all support services needed for modern semiconductor research, including a 3,000-square-foot cleanroom, as well as areas dedicated to integrated-circuit testing and equipment maintenance. Equipment in the teaching laboratory includes photolithographic aligners, diffusion furnaces, a thin film evaporator, wet chemistry benches and significant measurement and inspection equipment. The advanced research laboratory presently features a scanning electron microscope, rapid thermal annealer, chemical vapor deposition, reliability test equipment and several lasers for teaching and research.

Research Center for Waste Utilization (RCWU)

Director
Chih-shin Shieh, Ph.D., Principal Research Scientist, Environmental Sciences

The RCWU provides government organizations and the private sector with development facilities and personnel to design advanced techniques for waste management and utilization of solid and hazardous waste products. The research is directed toward developing technically and economically sound processes and procedures to manage waste materials to protect the environment, promote optimum utilization and recover the energy value in wastes.

The center works in partnership with other universities, local, state and federal agencies, and industry to provide utilitarian solutions to waste management problems. Current research has included the use of combustion ash in cement block for construction of artificial reefs, conversion of waste to fuel and improved methods for recycling. Future efforts are planned to increase the efficiency of the resource recovery process, improve utilization of the ash by-products and improve the useful recycling of both plastics and paper waste products.

Robotics and Spatial Systems Laboratory (RASSL)

Director
Pierre Larochelle, Ph.D., Associate Professor, Mechanical Engineering

RASSL is dedicated to the development of mechanical systems which generate spatial motion and force transmission. Research focuses on achieving advances in design methodologies for these systems as well as the techniques for utilizing them in industrial and consumer applications. A mutually beneficial relationship has been achieved with local industry (e.g. NASA-KSC, GSMA, AMTI, RWT and ICS) that has resulted in motivating K–12 youth toward engineering, science, and technology through active involvement in the FIRST Robot Competitions. Equipment includes an AdeptOne SCARA robot, a Zevatech CT2000 Cartesian robot and a Motoman SV3x, as well as the computer capabilities needed for computer-aided synthesis, analysis, and design of robots and spatial systems.

Southeastern Association for Research in Astronomy (SARA)

Director
Terry Oswalt, Ph.D., Professor, Physics and Space Sciences

SARA is a consortium of six universities, led by Florida Tech, which operates a one-meter-class automated telescope at Kitt Peak National Observatory near Tucson, Arizona. The SARA members are Florida Tech, East Tennessee State University, the University of Georgia, Valdosta State University, Florida International University and Clemson University. Using an innovative, computer-controlled operating system, the observatory can operate interactively with an astronomer on-site as well as remotely from SARA institutions' home campuses. Observational data are transferred to SARA institutions via a high-speed link to the Internet and are also made available to other astronomers around the world. In addition to faculty research activities in a wide variety of areas, such as stellar evolution, active galaxy dynamics and origins of the universe, SARA operates a unique, multi-institution Research Experiences for Undergraduates (REU) program funded by the National Science Foundation. Each year this program provides summer internships to about a dozen students selected from around the country and offers an opportunity for these students to work one-on-one with faculty on research projects. The SARA REU program is one of the largest astronomy internship programs in the United States.

Southeastern Center for Advanced Transportation Research (SCATR)

Director
John J. Thomas, Ph.D., Research Professor, Biological Sciences

SCATR responds to advanced transportation concepts with an emphasis on development, demonstration and impact studies of alternative fuels. SCATR builds on the strengths and facilities of existing programs, while also developing partnerships with industry and cooperative efforts with national research organizations.

Alternative transportation fuels have potential for reducing dependence on petroleum. Substitution by any one option or group of options will impact the economics and technology of vehicular performance, fuel handling techniques, safety, material requirements, primary energy sources, air quality, fuel-cycle infrastructure and public response. The center has the existing personnel, resources and facilities to conduct research on the petroleum replacement issue and focus on the use of alternative fuels for transportation.

Sportfish Research Institute (SRI)

Director
Jonathan M. Shenker, Ph.D., Associate Professor, Biological Sciences

SRI is dedicated to studies of the sport fish species that are tremendously important to Florida. Research currently focuses on the use of the Indian River Lagoon as nursery habitat for juvenile tarpon, the basic biology and ecology of these juveniles, the genetic structure of tarpon populations and the role of offshore artificial reefs in creating habitat for diverse sport fish species. In addition to field and laboratory research, SRI personnel present talks and provide information to local and regional sport fishing organizations and publications. Funded in part by state and local grants, SRI also seeks funding and participation from corporations associated with the fishing industry and from private individuals.

Vero Beach Marine Laboratory (VBML)

Director
Junda Lin, Ph.D., Professor, Biological Sciences

Deputy Director
Elizabeth A. Irlandi, Ph.D., Assistant Professor, Oceanography

VBML is located on five acres of oceanfront property in nearby Vero Beach. This facility serves as a field station for the university in support of research and teaching in the marine sciences. The beachfront location of VBML provides ready access to field study sites for work on the biology of coastal organisms and for studies of physical and geological processes of the coastal zone. Major research efforts at the laboratory are related to mariculture, the ecology of artificial reefs composed of stabilized waste material and marine corrosion processes. The center has a seawater system and extensive holding tanks for mariculture work. A two-story

laboratory building, equipped with seawater tables and flow-through seawater, supports research on mariculture, ecology and toxicology of marine organisms. Classroom and seminar areas, offices and dry laboratory facilities are provided in the main laboratory building. Salt-spray and seawater immersion facilities are available for research on marine corrosion.

Wind and Hurricane Impacts Research Laboratory (WHIRL)

Director
Jean-Paul Pinelli, Ph.D., Associate Professor, Civil Engineering

WHIRL is dedicated to the study of the effects and impacts of wind storms, including hurricanes, tornadoes and thunderstorms, and other related meteorological hazards (e.g., flooding and tidal surges) on the natural environment and man-made structures. The laboratory involves a multi-disciplinary team of engineers, scientists and business experts. It takes advantage of a geographic location in the heart of Florida's Space Coast to serve the needs of industry, government and the public in wind hazard mitigation. The laboratory's activities include research on mitigation of losses of life, property and the environment, education of the public through dissemination of information and development of multidisciplinary program of study focused on wind engineering and wind-related socioeconomic studies and analyses.

Research topics in the lab include action of strong winds and storm surges on structures; evaluation of codes, standards and retrofitting techniques for buildings and infrastructure systems; risk assessment for existing structures, coastal erosion, sediment transport and environmental damage due to storm surges and floods; development of remote sensing tools for assessing and monitoring hurricane damage, wind speed and flood levels; fundamental wind and meteorological research; wind tunnel modeling and testing; statistical studies, analysis of economic impacts and development of potential damage maps for hurricane hazards in Florida.

Wireless Center of Excellence (WiCE)

Director
Philip S. DiPiazza, Ph.D., Visiting Professor, Electrical Engineering

WiCE is a center devoted to creating a new generation of wireless engineering professionals through education and research. Driven by its academic program, WiCE considers wireless to be any system or device that relies on electro-magnetic-wave propagation to perform one or more of its functions. This context includes such diverse applications as radar, global positioning, location, sensing etc., as well as the broader class of communications systems such as satellites, point-to-point/multi-point, WLAN, wireless WAN, etc. In partnership with industry, WiCE offers the opportunity for faculty and both undergraduate and graduate students to engage in research and to study wireless concepts in a variety of courses. It is focused on two strongly related disciplines, wireless systems and microwave engineering, and is supported by significant laboratory facilities as described under "Wireless Center of Excellence Laboratory" in the "Electrical Engineering" section of this catalog.

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Campus Map

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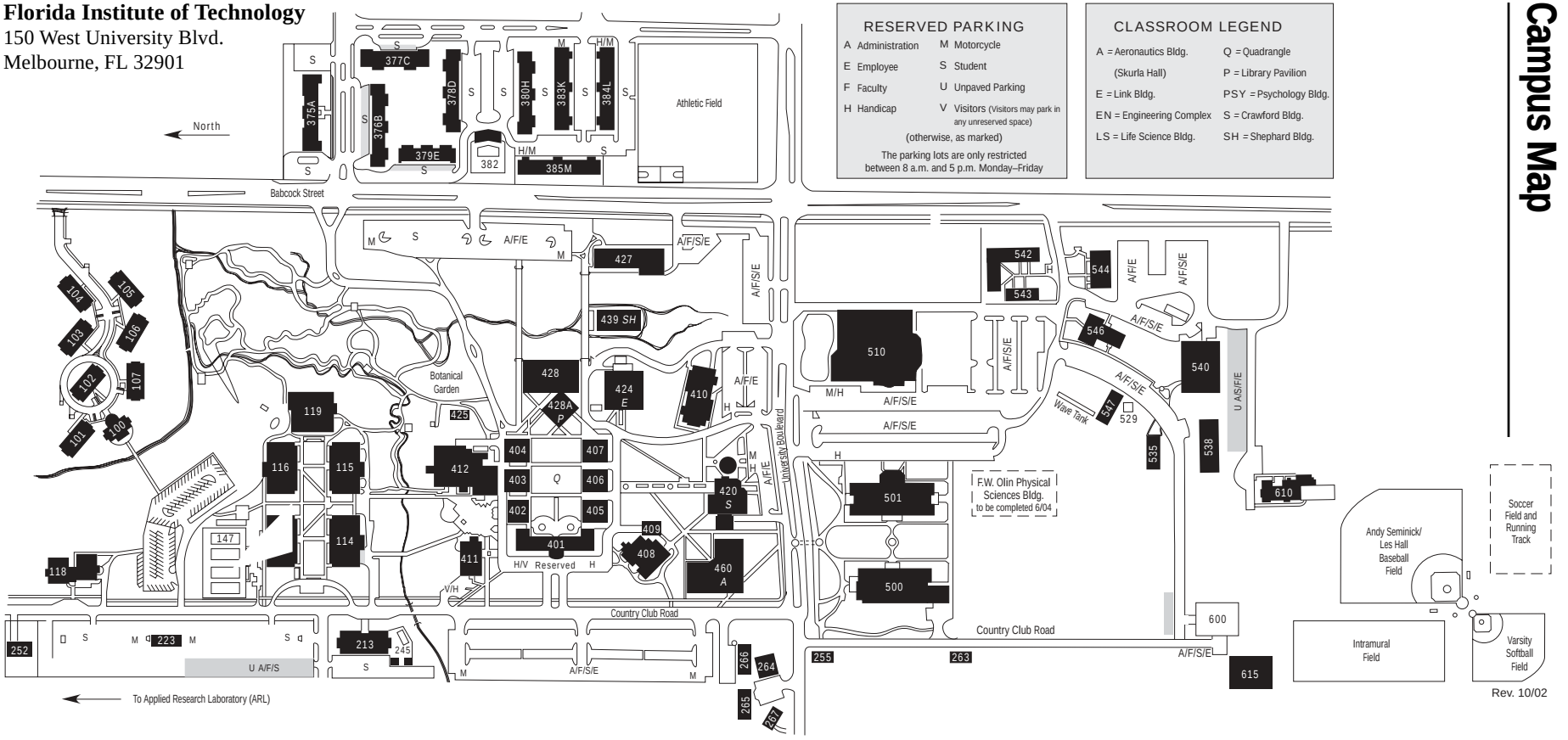

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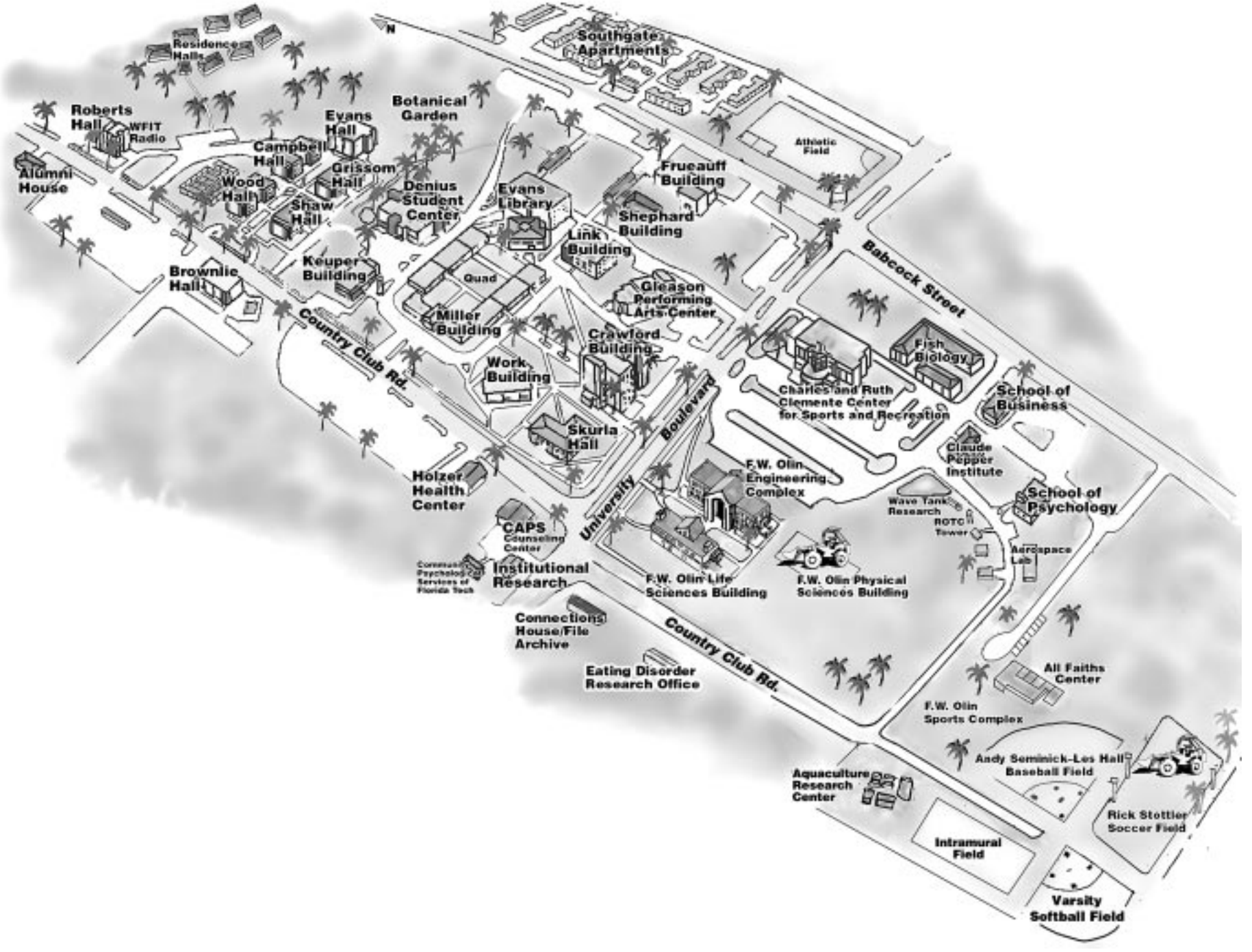
Applied Research Laboratory (ARL)

The Vice President for Public Relations, University Publications, University Communications, Vice President for Development, Facilities Management, research offices and laboratories are located at 328 W. Hibiscus Blvd., Melbourne.

School of Extended Graduate Studies (SEGS)

SEGSl is located in the Conlan Professional Center at 1501 Robert J. Conlan Blvd., Palm Bay.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Evans Library
Frueauff Building
Athletic Field
Shephard Building
Link Building
Babcock Street
Keuper Building
Brownlie Hall
Quad
Gleason Performing Arts Center
Country Club Rd.
Miller Building
Crawford Building
Work Building
Fish Biology
Charles and Ruth Clemente Center for Sports and Recreation
School of Business
Skurla Hall
Boulevard
University
Claude Pepper Institute
F.W. Olin Engineering Complex
Holzer Health Center
Wave Tank Research
ROTC Tower
School of Psychology
CAPS Counseling Center
Aerospace Lab
Institutional Research
F.W. Olin Life Sciences Building
F.W. Olin Physical Sciences Building
Connections House/File Archive
Country Club Rd.
Eating Disorder Research Office
All Faiths Center
F.W. Olin Sports Complex
Andy Seminick-Les Hall Baseball Field
Aquaculture Research Center
Rick Stottler Soccer Field
Intramural Field
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Aeronautical Science	7103		
Flight Option	7102		
Airport Development and Management		8214	
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SCHOOL OF EXTENDED GRADUATE STUDIES

	P.M.B.A	M.P.A.	M.S.M.	M.S.
Acquisition and Contract Mgmt.	8397		8398	8399
Business Administration	8391			
eBusiness	8356		8355	
Human Resources Management	8400		8386	8350
Information Systems	8396		8390	
Logistics Management			8387	8322
Management			8381	
Materiel Acquisition Management				8320
Project Management				8357
Information Systems				8358
Operations Research				8359
Public Administration		8401		
Space Systems				8137
Space Systems Management				8315
Systems Management				8330
Information Systems				8402
Operations Research				8331
Transportation Management			8388	

COLLEGE OF SCIENCE AND LIBERAL ARTS

SCIENCE	B.A.	B.S.	M.S.	Ed.S.	Ed.D.	Ph.D.
Biochemistry		7028				
Biological Sciences						9021
Aquaculture		7026				
Biotechnology			8024			
Cell/Molecular Biology			8022			
Ecology		7021	8021			
General Biology		7022				
Marine Biology		7023	8023			
Molecular Biology		7025				
Preprofessional Biology		7024				
Chemistry			8031			9031
Chemical Management		7032				
General Chemistry		7031				
Premedical Chemistry		7036				
Research Chemistry		7034				
Interdisciplinary Science		7035				
Military Science		7037				
Physics		7101	8101			9101
Preprofessional Physics		7135				
Space Sciences		7132	8132			9132
Astronomy/Astrophysics		7136				
MATH SCIENCES						
Applied Mathematics		7073	8073			9073
Operations Research			8074*			9074
LIBERAL ARTS						
Communication		7183				
Humanities	7185					
Technical and Professional Communication			8180			
EDUCATION						
Computer Education			8129			
Environmental Education			8119			
Mathematics Education		7150	8127	8927	9150	9127
Science Education			8120	8900	9120	9124
Biology		7121				
Chemistry		7122				
Computer Science		7128				
Earth/Space Science		7129				
General Science		7124				
Physics		7125				

**Program also offered at off-campus sites*

SCHOOL OF MANAGEMENT

	B.S.	M.B.A.
Accounting	7267	
Business Administration	7067	8300
Business and Environmental Studies	7167	
Information Systems	7367	
Management Information Systems	7467	

SCHOOL OF PSYCHOLOGY

	B.A.	B.S.	M.S.	Psy.D.	Ph.D.
Applied Behavior Analysis			8147		
Clinical Psychology				9144	
Industrial/Organizational Psychology			8145		9145
Psychology	7144	7141			

NONDEGREE PROGRAMS

General Engineering	7040
General Science	7050
General Studies	7060
Continuing Education	0100