
CAPITOL TECHNOLOGY UNIVERSITY
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CAPITOL TECHNOLOGY UNIVERSITY

2015-2016 Catalog

General Information

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General Information

Directory

Capitol Technology University

11301 Springfield Road
Laurel, MD 20708-9758

Main Telephone Numbers

301-369-2800
888-522-7486

Admissions

Washington, DC	301-953-3200
Toll Free	800-950-1992
Fax	301-369-2326
Distance Learning	866-960-9620

Undergraduate Admissions Email
admissions@CapTechU.edu
Graduate Admissions Email
gradadmit@CapTechU.edu

Website

www.CapTechU.edu

Office Hours

The following offices are open Monday through Friday, 8:30 a.m.- 5 p.m. (EST).

Executive Suite
- President
- Vice President for Academic Affairs
- Vice President for Advancement
- Vice President for Enrollment and Student Services
- Vice President for Finance and Administration/CFO

Office of the Dean
- Dean of Business and Information Sciences
- Critical Infrastructures and Cyber Protection Center

Administration and Human Resources
Advancement and Alumni Services
Career Services*
Communications and Publications

*Evening appointments are available.

The following offices are open as indicated (EST).

Admissions
M, F 9 a.m.- 5 p.m.
T-Th 9 a.m.- 7 p.m.
Saturday appointments are available.

Business Office
M, F 9 a.m.- 5 p.m.
T-Th 9 a.m.- 7 p.m.

Financial Aid
M,F 9 a.m.-5 p.m.
T-Th 9 a.m.- 7 p.m.

Registration and Records
M, F 9 a.m.- 5 p.m.
T-Th 9 a.m.- 7 p.m.

Student Life
M-F 9 a.m.-5 p.m.
Evenings by appointment.

Emergency Closing

In the event of severe weather or other emergencies, any possible cancellations or late openings will be announced to area radio and television broadcasts and posted on the university website.

The university maintains a recorded message at 301-369-2800, 888-522-7486, 800-950-1992 and 301-953-3200 and posts a weather advisory on the website when possible. Due to power outages and other circumstances that occur during adverse weather, it is not always possible to update this information. It is the responsibility of students to tune in to the radio or television for announcements.

The television channels and radio stations notified by the university are listed in the student handbook and on the university website.

Accreditation

Capitol Technology University is authorized by the state of Maryland (Maryland Higher Education Commission, 6 N. Liberty St., Baltimore, MD 21201, 410-767-3301) to confer bachelor of science (BS) degrees in astronautical engineering, business administration, computer engineering, computer science, cybersecurity, electrical engineering, management of cyber and information technology, mobile computing and game programming, software engineering and web development. The university is authorized to confer BS and associate in applied science (AAS) degrees in computer engineering technology, electronics engineering technology, and telecommunications engineering technology. The BS programs in business administration and management of cyber and information technology are fully accredited by the International Assembly for Collegiate Business Education (IACBE, PO Box 25217, Overland Park, KS 66225).

The university is authorized by the state of Maryland to confer master of science (MS) degrees in astronautical engineering, computer science, cyber and information security, electrical engineering, information systems management, and internet engineering. The university is authorized by the state of Maryland to confer a master of business administration (MBA) degree. The MBA and information systems management programs are fully accredited by the International Assembly for Collegiate Business Education (IACBE, PO Box 25217, Overland Park, KS 66225).

The university is authorized by the state of Maryland to confer a doctorate of science (DSc) in cybersecurity and a doctorate of philosophy (PhD) in management and decision sciences.

The university is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools (Commission on Higher Education, Middle States Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, 215-662-5606). The BS degree programs in electrical engineering, astronautical engineering and computer engineering are also accredited by the Engineering Accreditation Commission of Accreditation Board for Engineering and Technology. The baccalaureate degree programs in computer engineering technology, electronics engineering technology and telecommunications engineering technology are also accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (111 Market Place, Suite 1050, Baltimore, MD 21202, 410-347-7700). Capitol Technology University is approved for veterans' education by the Maryland Higher Education Commission.

Equal Opportunities

Capitol Technology University actively subscribes to a policy of equal educational and employment opportunity and, in accordance with Title IX of the education amendments of 1972, does not discriminate on the basis of race, color, religion, gender, gender identity or expression, gender orientation, sexual orientation, national or ethnic origin, genetics, disability, age, or veteran status in admission, treatment of students or employment.

The following members of the Capitol Technology University community are designated to receive inquiries concerning the university's application of the equal opportunities statement. Inquiries related to the application of Title IX may be referred to the campus Title IX Coordinator, Melinda Bunnell-Rhyne; the Director of Administration; or any Vice President of the university or to the Department of Education's Office of Civil Rights.

Melinda Bunnell-Rhyne
Dean of Student Life and Retention
Title IX Coordinator and Section 504 Coordinator
11301 Springfield Rd. Laurel, MD 20708
301-369-2491
deanofstudents@CapTechU.edu

Changes in Catalog Information

Capitol Technology University reserves the right to make changes in policies, procedures, degree requirements, schedules, course offerings and other university standards or announcements to meet circumstances that may arise after publication.

The provisions of this publication are not to be regarded as an irrevocable contract between the student and Capitol Technology University. The university reserves the right to change any provision or requirement in any university publication without notice at any time during the student's term of attendance.

Capitol Technology University reserves the right to require a student to withdraw, or to refuse to grant a degree or certificate if, in the judgment of the administration of the university, the student fails to meet the university's requirements satisfactorily. The university reserves the right to change tuition and fees at any time at the discretion of the Board of Trustees.

Student Records

The procedures and guidelines adopted by Capitol Technology University (hereinafter occasionally referred to as the "university") regarding student records comply fully with the Family Educational Rights and Privacy Act of 1974 (FERPA). This federal law establishes the rights of students to inspect and review their records, and provides students with a mechanism for correcting inaccurate or misleading data found within a student's education record. Moreover, FERPA guarantees the privacy of students' education records. Specifically, FERPA limits the disclosure of personally identifiable, non-directory, information from education records, without the consent of the student. Consistent with its obligations, Capitol Technology University will not release personally identifiable information from a student's education records without the student's consent, except in circumstances permitted by FERPA (e.g., in connection with a health or safety emergency).

Education records are records, files, documents and other materials containing information directly related to a student that are maintained by Capitol Technology University. For example, records maintained by faculty advisors, the Office of Admissions, Office of Financial Aid, the Business Office, the Office of Career Services, Dean of Students' Office, and Office of Registration and Records, are generally education records.

Student Review of Education Records

Students are entitled to inspect and review education records maintained by Capitol Technology University. Students who wish to access a particular record should contact the office responsible for maintaining that record. The university will produce the record within a reasonable period of time, although in most instances the university will allow the student to review the record immediately upon request. Certain documents, including financial records of parents, are not available to students.

A student who, after reviewing their records, believes they contain information that is inaccurate, misleading, or in violation of the student's rights of privacy, may request that Capitol Technology University amend the record. Students should submit such requests, in writing, to the official from whom the record was obtained. Alternatively, students may submit written requests to Melinda Bunnell-Rhyne, Dean of Student Life and Retention. Capitol Technology University will decide whether to amend the record, as requested by the student, within a reasonable time after receiving the request. If Capitol Technology University declines to amend the record as requested, it will inform the student of its decision. In this instance, the student is entitled to request a hearing to determine the merits of his or her request.

Students may request copies of their Capitol Technology University education records. Reproduction of academic transcripts costs $10 per copy. However, Capitol Technology University will not copy records for students with unpaid financial obligations.

Disclosure of Information Contained in Education Records

Capitol Technology University will generally not disclose personally identifiable information contained in a student's education records without the student's prior consent. However, FERPA does allow Capitol Technology University to disclose such information in certain, limited circumstances. For example, Capitol Technology University may disclose information in a student's education records to school officials within Capitol Technology University whom the university has determined to have a legitimate educational interest in the information. A school official generally has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility. School officials include: professors; instructors; administrators; health staff; counselors; attorneys; clerical staff; trustees; members of committees and disciplinary

boards; and a contractor, volunteer or other party to whom the university has outsourced institutional services or functions.

Capitol Technology University may also disclose a student's directory information without consent. Directory information includes, but is not limited to, the student's name, address, telephone number, electronic mail address, photograph, date and place of birth, major field of study, grade level/class, enrollment status (e.g., undergraduate or graduate, full-time or part-time), dates of attendance, participation in officially recognized activities and sports, degrees, honors, and awards received, and previous educational agencies or institutions attended.

Students may restrict the release of directory information, except to school officials with legitimate educational interests. To do so, a student must make a written request directed to the Office of Registration and Records. Once filed, this request will become a permanent part of the student's record until the student instructs the university, in writing, to remove the request.

The Capitol Technology University Commitment

Capitol Technology University guarantees its qualified bachelor's degree graduates placement in the field of engineering, engineering technology, computer sciences, information technology or business with a competitive salary within 90 days of graduation, or Capitol Technology University will provide up to 36 additional undergraduate credits tuition free while students continue their job search.

The Capitol Technology University Commitment is a written job guarantee between the student and Capitol Technology University. The commitment is open to all full-time undergraduate students (U.S. citizens or permanent residents).

Contact the Office of Career Services for more information.

Allegations that Capitol Technology University is not in compliance with FERPA may be directed, in writing, to the Family Policy Compliance Office at the Department of Education.

Locations

Laurel Campus

Capitol Technology University occupies the grounds of the former Beltsville Speedway. Located just off the Baltimore-Washington Parkway, the campus is minutes away from NASA Goddard Space Flight Center, the Beltsville Agricultural Research Center, the laboratory headquarters of the U.S. Food and Drug Administration, and the Patuxent Wildlife Research Center.

The tree-ringed suburban campus features gentle slopes and a small pond. The sleek white forms of M/A-COM Hall, MCI Hall and Telecommunications Hall are connected by glass-enclosed pedestrian walkways. The William G. McGowan Academic Center houses state-of-the-art classrooms, the Critical Infrastructures and Cyber Protection Center, the Space Operations Institute, the Cyber Lab, the Fusion Lab, and the Identity Credentialing and Access Management (ICAM) Lab. The buildings have high ceilings, skylights and exterior reflective glass walls overlooking the woods. Apartment-style student housing is available for 90 to 120 students.

Southern Maryland

Selected courses leading to degrees in electrical engineering and computer science are offered in classrooms at the Southern Maryland Higher Education Center in California, Maryland, near the Patuxent River Naval Air Station.

Mission, Vision and Learning Goals

Motto from the University Seal

Aut viam inveniam aut faciam (Latin). Either find a way or make one.

Mission

The mission of Capitol Technology University is to educate individuals for professional opportunities in engineering, computer and information sciences, and business. We provide relevant learning experiences that lead to success in the evolving global community.

Vision

In 2020, in accordance with the Mission Statement, Capitol Technology University will be seen by its constituents and by the public as:

A STEM-focused institution educating in engineering, information sciences and business, that has flexibility and opportunities to grow, and that adapts offerings to emerging workforce and societal needs.

A provider of hands-on, career-relevant learning that is conducted in an interdisciplinary and interactive environment, where faculty and staff support student achievement and success.

A university that delivers programs of similarly outstanding quality through face-to-face and virtual classrooms, and other forms and mixtures of teaching methods that align with the learning needs of our students.

An organization with faculty and leadership who stimulate and implement new curricula for the professions we serve, and that benefit a diverse community of learners.

An organization that is closely linked to its constituency of local, national, and international partners in business and government, and that provides influence for future technology development and policies.

A university that develops graduates with communications, analysis and critical thinking skills that allow them to be successful in a global environment and pursue lifelong learning as technical professionals, leaders and innovators.

Values

The core values are the characteristics we embrace in working together to fulfill the mission and achieve the vision of the institution.

- Quality – always striving for continuous improvement
- Growth – expanding and changing to meet new needs of society
- Leadership – offering creative, supportive and shared leadership
- Balance – maintaining a balance between competing needs
- Integrity – being honest, ethical and open
- Teamwork – exercising collective effort to support students and staff
- Communications –providing timely and useful information
- Flexibility – discovering and seizing opportunities
- Safety – maintaining awareness and prevention of accidents and threats

Students

Capitol Technology University's student body mirrors the 21st century diversity of American higher education. Academically prepared and motivated high school graduates come to Capitol Technology University to complete educational experiences that will open career opportunities for them. Working adults, veterans and transfer students come to Capitol Technology University to complete undergraduate programs of study that will open or enhance career opportunities for them. Established professionals come to Capitol Technology University to expand their skills by earning graduate degrees or completing short-term learning experiences. The diversity of students enriches the learning environment of the university.

Learning Goals

Capitol Technology University seeks to prepare graduates who demonstrate four characteristics:

Employability: The ability to enter and advance in technical and managerial careers, appropriate to their level and area of study, immediately upon graduation.

Communications: Mastery of traditional and technological techniques of communicating ideas effectively & persuasively.

Preparation of the Mind: The broad intellectual grounding in technical and general subjects required to embrace future technical and managerial opportunities with success.

Professionalism: Commitment to life long learning, ethical practice and participation in professions and communities.

The Educational Philosophy of the Academic Programs

Four principles define the educational philosophy of Capitol Technology University. Academic programs must be:

- Grounded in both theory and practice in order to prepare graduates for immediate employment and long-term professional careers,
- Fundamentally hands-on and practice oriented to provide the technical skills for students to be immediately employable upon graduation,
- Tied to the contemporary needs of industry so that curriculum reform and development are pragmatic, and
- Enriched by courses in the liberal arts to provide every graduate with an enhanced sense of self, society, history and aesthetics.

Strategic Goals

Elevating Education and Expanding Enrollment

Capitol Technology University is an institution that offers career relevant curriculum with quality learning outcomes. The strategy includes continuing to expand educational offerings at higher levels of degree attainment, program completion, and learner qualifications and outcomes. The university will accelerate the strategy to become more globally known and active in serving international countries, companies and learners. The 52-acre campus will be built out to accommodate current and future growth in volume and diversity of educational programs and student services. Capitol will increase student enrollment to 1500 by Fall 2018.

Diversifying Institutional Resources

The University will enhance its financial resources by expanding the range and amount of funding available to the institution, aligning costs with strategic initiatives, and expanding corporate relationships. Capitol will increase annual revenue from philanthropy to $1.34 million by 2018 through a coordinated advancement plan.

Extending Family of Organizational Partners

The mission of Capitol Technology University is to provide relevant learning experiences that lead to success in the evolving global community. In order to achieve the mission the university will enhance and expand corporate relationships. Capitol will increase annual revenue from services to corporations and government agencies to $500,000 by 2018.

Maintaining Institutional Viability

Capitol Technology University is committed to providing relevant learning in a quality learning environment. The university continuously reviews the higher education landscape to identify opportunities to revise and enhance the learning environment, either online or on campus. Capitol will develop plans to ensure the sustainability of the organization.

History

Since its start more than 80 years ago, Capitol Technology University has remained true to its mission – preparing students for careers in a quickly changing world. With a tradition of academic excellence and practical learning, Capitol Technology University has equipped its alumni with the knowledge and skills to evolve with the advanced sophistication of technology.

Capitol Technology University was founded in Washington, DC, as the Capitol Radio Engineering Institute in 1927 by Eugene H. Rietzke. A Navy veteran and radio operator, Rietzke foresaw the need for an advanced school that could produce talented radio and electronics technicians. CREI began as a correspondence school, but its popularity led to the 1932 opening of a residence division allowing students to work hands on in laboratories. As radio technology improved, new training programs and courses were quickly added. Following World War II, CREI became one of the first three technical institutes accredited by the Engineers' Council for Professional Development.

The institute entered a new era in the mid-1950s when it began awarding three-year AAS degrees. The school expanded its reach to new programs in applied engineering and electronics. To reflect this evolution, the institute changed its name to Capitol Institute of Technology in 1964. It awarded its first bachelor of science degrees in 1966 to four graduates of its electronics engineering technology program. Anticipating the need for more room, Capitol relocated in 1969 to a leased space in Kensington, Maryland.

During the following decade, enrollment increased and so did the program offerings. In 1976 the Middle States Association of Colleges and Secondary Schools granted accreditation to Capitol, and the National Science Foundation provided funding for new instructional scientific equipment. Quickly outgrowing its space, Capitol's leaders recognized a need for a permanent home and began searching for a new campus.

The result of that search was a relocation to Laurel, Maryland. Capitol purchased the 52-acre former site of the Beltsville Speedway, built new academic facilities and opened the doors to students in 1983. Enrollment swelled and two more engineering technology degrees were added. Within the next decade a capital campaign and funding from the state of Maryland raised millions for buildings, equipment and a scholarship endowment. The campus expanded with Telecommunications Hall and the 340-seat Avrum Gudelsky Memorial Auditorium. In 1987, the school became Capitol College, a name it would retain until September 2014.

In the late 1980s, Capitol's leadership again recognized the transformation in the institution. The technical-based curriculum had become broader, with an increasing incorporation of humanities and social science courses. With a spacious campus and four-year degrees, the school had shed its skin as a technical institute. Preferring a title and an environment that would better suit its presence, the Board of Trustees changed the school's name to Capitol College. Along with the name change came a plan to offer more degrees in engineering and management, build on-campus housing and convert from a quarterly academic calendar to a semester system.

Master's degrees were introduced in the 1990s. Capitol began several outreach efforts and business partnerships, such as the NASA PREP summer program for minority students and the Maryland Distance Learning Network. Meanwhile, Capitol expanded the John G. and Beverly A. Puente Library, creating a spacious state-of-the-art facility with a multimedia teaching center. The opening of the William G. McGowan Academic Center in 2005 marked the next era for Capitol. The academic center hosts an expanded computer science department, the Space Operations Institute, and the BRAC-funded Cyber Battle Lab.

With a new century and millennium now under way, the time came again to take stock of Capitol's achievements and set a course for its future growth. The radio institute founded in 1927 had burgeoned over the decades in ways that few could have predicted. It had become a full-fledged higher education institution, offering a wide palette of academic disciplines and degrees. Reflecting these changes, the school was renamed Capitol Technology University in 2014.

Today, Capitol is the only independent institution of higher education in Maryland that specializes in providing a relevant education in engineering, business and related fields. It takes pride in its proven record of placing graduates in competitive careers with salaries that are higher than the industry average. As a respected regional leader, Capitol continues attracting the attention of government agencies and corporate partners. Through a partnership with NASA, Capitol offers academic programs in astronautical engineering and practical training at its Space Operations Institute. The National Security Agency and Department of Homeland Security have designated Capitol a National Center of Academic Excellence in Information Assurance Education, and the Institute of Electrical and Electronics Engineers has named the university one of its twelve educational partners. In 2010, Capitol introduced a doctor of science in information assurance to its academic repertoire, allowing students to pursue their education to the highest level in the discipline. In 2015, the university launched a PhD program in management and decision sciences.

While new innovations spur new developments and industries, the foundations that are taught at Capitol Technology University – thinking critically, actively and creatively – will remain. As it looks to the future, Capitol Technology University remains committed to providing students with a quality education and the relevant experience to excel in a changing world.

The Centers of Excellence

Capitol Technology University has a vision, mandated by industry leaders, government officials, and education policy makers, to answer the call to provide a new generation of engineers and technology professionals who have higher levels of innovation and leadership in order to ensure the national workforce is competitive in science, technology, engineering, mathematics, and business.

Critical Infrastructures and Cyber Protection Center

Capitol established the Critical Infrastructures and Cyber Protection Center (CICPC) to address the technical and managerial needs of the nation's professional workforce in the areas of critical infrastructure protection and homeland security. The CICPC delivers professional training to the homeland security workforce, as well as facilitating employment connections between our talented students and the federal agencies and industry contractors that hire them. CICPC programs and services specifically target the needs of individuals employed in fields responsible for securing what many take for granted – the American way of life.

From technical training in areas such as Computer Forensics and SCADA protection to managerial areas such as project management and supply chain management, Capitol provides customized programs featuring dedicated faculty who bring years of experience with theory and concepts. Our programs can be delivered at the customer site, on campus, and/or via our synchronous distance-learning platform.

Innovation and Leadership Institute

The Innovation and Leadership Institute offers programs designed to build the technical and social skills of young people and working adults who want to succeed in technology entrepreneurship and leadership careers. ILI sponsors the Capitol President's Forums and speaker series, which bring distinguished speakers and panelists together with students and community members to share insights on innovation, entrepreneurship and leadership.

Future ILI endeavors will continue to deliver seminars, conferences and symposia on innovative topics, and non-credit professional development programs in information assurance, technology management and entrepreneurship.

Other ILI activities include:

- a program of applied innovation and leadership research, resulting in the publication of best practices, organizational trends and successful leadership stories;
- providing facilities and university faculty as neutral resources focused on bringing together people with common technology and leadership challenges to solve problems;
- programs for minorities and women, two groups that continue to be under-represented in both technology and business leadership;
- outreach programs to high school and community college audiences to increase interest in engineering, technology and business leadership careers.

Space Operations Institute

The Space Operations Institute (SOI) was established at Capitol in 2003 with a grant from the National Aeronautics and Space Administration (NASA).

The SOI builds on Capitol's established engineering foundation and works closely with NASA and industry partners to understand the aerospace industry's changing skills requirements. The SOI provides support for educational programs that prepare students for careers in the aerospace industry. The SOI provides the infrastructure to provide hands-on experience in satellite mission operations and planning, and developing and operating a picosatellite ground system.

Students enrolled at Capitol may apply for an industry sponsored or internal university SOI internships. Industry sponsored student interns work at NASA, the employers facility, or on campus. SOI interns work in the Fusion Lab or SOI Control Center on development and ground system operations projects. The SOI provides students with practical experience that supplements their academic learning. The SOI currently has interns working on the Tropical Rainforest Measurement Mission (TRMM) at NASA Goddard Spaceflight Center, the James Webb Telescope at the Hubble Space Science Institute in Baltimore, and the Jet Propulsion Laboratory in California.

SOI management is continually seeking new opportunities with NASA and private industry to expand training and learning opportunities for students.

Center for Space Science Education and Public Outreach

The Center for Space Science Education and Public Outreach provides hands-on education and workforce development experiences for students in K-12, community colleges, colleges or universities and those who support them in achieving leadership careers in the science, technology, engineering and math (STEM) fields.

The Center's vision is to assist in educating and developing the future leaders of the STEM career fields through utilizing space science, astronomy and other related areas of study at Capitol Technology University to engage students of all ages.

Working at the local, regional, and national levels, the Center will:

- assist the Capitol Technology University Space Operations Institute in fulfilling their mission;
- provide hands-on educational experiences for middle school, high school, community college, and college students to both introduce them to STEM fields and continue to expand their interest in these fields as possible career choices;
- provide leadership development opportunities, in conjunction with the Innovation and Leadership Institute, to enable students to be future leaders within the STEM fields;
- support the dissemination of information regarding STEM workforce and leadership opportunities.

Affiliations, Memberships and Partnerships

The university's academic offerings are strengthened by relationships with government agencies, professional societies and private industry.

CyberWATCH

Capitol Technology University is a member of CyberWATCH, an Advanced Technological Education Center funded by a grant from the National Science Foundation. CyberWATCH, founded in 2005 as a consortium for ten institutions in the DC metro area, has grown to 95 member institutions across 29 states and the District of Columbia. The CyberWATCH mission is to increase the quantity and quality of the cybersecurity (information assurance) workforce through increased education, curriculum development, faculty development, student development, career pathway exploration and development and public awareness.

Institute of Electrical and Electronics Engineers

Capitol Technology University is a participating university partner with the Institute of Electrical and Electronics Engineers. Individuals who hold full membership in IEEE at the time of registration will receive a 10 percent discount on tuition charges upon verification.

National Defense University

Capitol Technology University is a partner with the National Defense University iCollege (formerly Information Resource Management College) to advance the professional skills and knowledge of active-duty military, veterans and select Department of Defense employees. This arrangement provides an opportunity for military and DoD students who have completed selected NDU programs to transfer up to 15 credits in lieu of Capitol Technology University graduate coursework.

National Security Agency and Department of Homeland Security

The National Security Agency and the Department of Homeland Security initially designated Capitol Technology University as a National Center of Academic Excellence in Information Assurance Education (CAEIAE) in 2003, after a thorough review of the master of science in information assurance (MSIA) curriculum. In 2007, Capitol became one of

only three institutions nationwide to be certified as meeting all six standards (at the most advanced levels where applicable) as determined by the Committee on National Security Systems. Today, Capitol Technology University remains the only institution with this all-inclusive mapping that delivers its program fully online.

Students successfully completing the requirements for the degree are awarded, in addition to the graduate degree, a federally accepted certificate attesting that they studied the requirements of the six national training standards. In the process of earning the MSIA, students have the opportunity to earn three post-baccalaureate certificates; Network Protection, IA Administration, and Security Management. For more information on these certificates see the Post-baccalaureate Certificates section of the university catalog.

Maryland Community College Partner Institutions

Capitol Technology University has collaborated with ten Maryland colleges to provide transfer/articulation agreements in certain degree fields. These colleges include Anne Arundel Community College, Baltimore City Community College, College of Southern Maryland, Community College of Baltimore County, Hagerstown Community College, Harford Community College, Howard Community College, Montgomery Community College, Prince George's Community College and WorWic Community College. These agreements allow students from these participating institutions to easily transfer credits to Capitol Technology University.

Online Learning

Capitol Technology University offers all graduate degrees and certificates entirely online. In addition, undergraduate third and fourth year courses leading to a BS in Business Administration, Information Assurance, or Management of Information Technology are available online for degree completion at a distance. Students enrolled in Capitol's online programs meet in virtual classrooms using a web-based application that delivers interactive live classes. In addition, a course management system provides course materials, homework, grades, and discussion threads. Online students participate in real-time class sessions once or twice a week. During the live lectures, students view slides or live programming and diagnostics while listening to professors and other students speaking in real-time. Student interactivity is encouraged and is made possible through chat and audio discussions. In a way similar to a traditional classroom, students can raise their hands using interface icons and ask questions using their microphones or by chatting. Outside of the live classroom, the knowledge exchange continues as students download and view course material, transmit homework assignments, post to discussion boards and collaborate with other classmates. A typical online course consists of 16 class sessions, alternating between synchronous ("live") lectures and asynchronous sessions. Asynchronous sessions can be recorded lectures or assignments that supplement topics discussed during the live lecture.

Because software vendors constantly update the online platforms, Capitol Technology University posts the latest computer system requirements for online learning on our support site, ask.CapTechU.edu. Use the search input box there to look for "minimum system requirements" or just "minimum." In general, most computers manufactured after 2008 meet the minimum requirements for online learning. The computers will also need audio capabilities for speakers and microphones. Lecture audio uses Voice over Internet Protocol (VoIP), so students will need an Internet connection with sufficient bandwidth (usually DSL or cable Internet but even wireless mobile devices with data plans should be sufficient for most classes). Remember that minimum requirements are bare minimums: more memory, faster processing speed, and faster Internet connections will always improve the online class experience. Even though it is possible and convenient to attend online classes with mobile devices, they limit capacities required in some classes. For example, a student might be required to upload and present a PowerPoint presentation or use another application.

To fully participate in a Capitol LIVE! virtual classroom, students must have access to a Windows or Linux PC or a Mac configured with a full-duplex sound card and a headset (or microphone and speakers).

Note that graduate students in Information Assurance labs and selected advanced undergraduate courses are expected to have more recent Windows systems with considerable RAM memory and hard drive space.

Students can get technical assistance by phone or e-mail (ask@CapTechU.edu) and around-the-clock support via our website at ask.CapTechU.edu. Phone support is available every hour classes are in session including 8:30 a.m. until 10 p.m. Monday-Thursday; 8:30 a.m. until 5 p.m. Friday; and 8:30 a.m. until 2 p.m. Saturday at 888-960-9620.

Academic Policies and Procedures

Program Advisors

Degree-seeking students are assigned academic advisors before registration. Students are encouraged to work closely with advisors in developing their programs of study. Academic advisors are available for guidance, but each student must assume final responsibility for conforming to university regulations and curriculum requirements.

Registration Procedures

Detailed registration information is provided before the beginning of each semester. Registration dates are listed in the university calendar beginning on page 126 and online. Students must be in good financial standing with the university to be eligible for registration services.

Registration forms can be obtained and submitted at the Laurel campus or online.

Late registration occurs during the first two weeks of the semester for all semester-length courses, or between the first and second class meeting for all term-length courses (both undergraduate and graduate). No term-length course registrations will be accepted after the second class meeting. The last day to add or drop a class is listed in the university calendar beginning on page 126 and online.

Cross Divisional Registration

Students pursuing an undergraduate degree who wish to enroll in graduate courses must meet with the dean of academics and receive approval from the dean prior to registration. This includes concurrent undergraduate students taking graduate level coursework to meet graduate degree requirements and students substituting graduate courses for undergraduate degree requirements. Courses taken at the graduate level to satisfy undergraduate degree requirements will not be counted toward the graduate level should the student choose to pursue a graduate degree. Course substitutions will be necessary for completing graduate credit requirements. Students interested in cross divisional registration should submit the appropriate paperwork to the Office of Registration and Records.

Audited Courses

Students who register to audit a course are charged the same tuition as those who register for credit. The grade of X is awarded at the end of the semester and is not used in computing the cumulative grade point average. Half-time, financial aid students that change to audit will have part or all of their aid returned to the federal government. Students receiving VA benefits will not receive payment for audited courses. Any student receiving financial aid contemplating an audit should contact the Office of Financial Aid. Once registered for audit, students are not permitted to change to credit after the first two weeks of the semester. The last day to change from credit to audit is listed in the university calendar beginning on page 126 and online.

Independent Study

Independent study in a course will be granted in only the most extraordinary circumstances. The professor who administers the independent study and the dean of academics must give permission for the course. When permission is given, the professor organizes the course requirements, including exams, homework, lab assignments, research and position papers, to compensate for the absence of classroom participation. Students must be in good academic standing to petition for independent study. Students interested in independent studies should consult with the dean of academics and submit all appropriate documentation to the Office of Registration and Records.

Change of Degree Program

Students who want to change degree programs must fill out a change of degree program form, which may be obtained in the Office of Registration and Records or online. The dean of academics must approve all changes of degree programs. Students who change their degree program are required to meet all requirements of the new programs that are in effect at the time of the change. Transfer credits and courses that have already been completed will be applied toward the new degree program where appropriate. Any student receiving financial aid contemplating a change of degree should see the Office of Financial Aid. Completed documentation must be submitted to the Office of Registration and Records after academic dean approval.

Double Degree Requirements

Undergraduate students who are currently enrolled and want to pursue two degrees (AAS or BS) must have a cumulative GPA (grade point average) of 2.5 or higher. For a second BS degree, the student must complete a minimum of 150 credits, with a minimum of 18 credits distinction between majors, of which at least 12 must be upper-level credits completed at Capitol Technology University. For a second AAS degree, the student must complete a minimum of 75 credits, with a minimum of nine credits distinction between majors, of which at least six must be 200-level or above. Undergraduate students who are currently enrolled in an AAS program and a different BS program must complete nine credits of distinction between the two degrees.

Graduate students who want to obtain two degrees may overlap two to three courses, depending on the degree program, but must otherwise complete all the requirements for both degrees. Should more courses overlap than is approved, the student must take additional courses to make up the credit requirement. Double-degree-seeking graduate students are encouraged to consult the dean of academics for advisement.

All students declaring a second degree must have academic dean approval and complete the change of degree program form. This may be obtained in the Office of Registration and Records or online.

Course Drop

There are two course drop periods. The first course drop period occurs during the registration period and ends on the last day for a 25% refund. The second course drop period occurs following the period for 25% refund and continues until the date indicated on the academic calendar.

For a course drop that takes place during the first period students are entitled to a percentage refund as outlined in the refund schedule. The course is removed from the student's transcript and no grade is assigned.

A course drop that takes place during the second period results in a mark of W on the student's transcript. A grade of W does not affect students' cumulative GPA. Failure to attend class does not constitute withdrawal from the course and does not eliminate a student's academic or financial responsibilities.

If a student drops all classes for the semester (zero credits), he/she is considered withdrawing from the university and should follow the procedure for withdrawal (as listed in the next section). Deadline dates for dropping a course with or without a W from a course are listed in the university calendar on page 126 and online.

Withdrawal from the University

Students who want to withdraw from the university or are dropping from all classes in a term or semester must complete a withdrawal form from the Office of Student Life or online. Students who interrupt their attendance for less than one academic year and are in good standing with Capitol Technology University at the time of the withdrawal do not need to reapply to the university. Also see "Readmission."

Failure to attend classes does not constitute withdrawal and does not eliminate students' academic or financial responsibilities. Students cannot withdraw during the week of final exams.

Withdrawal from the university may affect financial aid awards. Anyone receiving financial aid or VA benefits must see a financial aid administrator before withdrawing. Consult the university calendar on page 126 for specific withdrawal dates.

Readmission

Students who withdraw from the university are eligible for readmission at any time, unless they have been in violation of the university's academic regulations, or have been dismissed for disciplinary reasons. Students who have been admitted to the university and interrupt their attendance for more than one academic year (three consecutive semesters) must resubmit an application for admission. In this case, a readmitted student must meet the degree requirements in place at the time of readmission in order to qualify for graduation. Applications are available online. Arrangements for payment of outstanding

tuition balances must be made with the Business Office before readmission is approved.

Leave of Absence

Doctoral students may request a Leave of Absence (LOA) by completing the "Request for Leave of Absence" form on the myCapitol portal (Doctoral Student tab). When requesting an LOA, keep in mind all coursework must be completed within a five-year time period. Please note this does not include the additional two years allowed for dissertation completion.

All LoA requests must be submitted in writing, include the reason for the request and be signed and dated. In order to adhere to federal regulations of the Department of Education, the LOA, together with any additional leaves of absence, must not exceed a total of 180 days in any 12-month period. The 12-month period begins on the initial date of your LOA. At leave expiration, students must re-enroll or (if qualified) request an LOA extension. If you have not returned at the end of the 180-day period, the school is required to notify the Department of Education of your last date of attendance. This will affect your federal financial aid and your loan repayment status. Students with circumstances requiring LOA beyond 180 days should consider withdrawing from the program, retaining the right to reapply at a later date. LOA forms are provided on the MyCapitol portal.

Course Cancellation

The university can cancel a course for which an insufficient number of students are enrolled. Students will be notified of a cancellation by the first class session, and any payments made will be refunded in full or credited to your next term.

Course Prerequisites

When planning schedules for upcoming semesters, students should pay special attention to the course prerequisites. Students must obtain a grade of C or better in prerequisites for degree required courses. Those students not meeting the course criteria will not be allowed to register without approval from the dean of academics.

Completion of English Courses

Students seeking bachelor's degrees at Capitol Technology University must complete EN-101 and EN-102 before being permitted to register for junior-level classes. Transfer students must have equivalent transfer credits for EN-101 and EN-102 before being permitted to register for junior-level classes. Transfer students of junior status who do not have equivalent transfer credits for EN-101 and EN-102 must meet with the academic before registering.

Class Attendance

Each professor establishes regulations regarding class attendance at Capitol Technology University. Regular class and laboratory attendance is necessary to achieve maximum success in university work. Students receiving financial aid who do not attend classes will lose their aid.

Transcripts

Student academic records are maintained exclusively by the Office of Registration and Records. These records are considered privileged documents between the student and the university and will be released only upon a signed, written request from the student, except as may be required by law.

Transcripts will be issued when the student submits a signed request form and the student's financial account is current. A $10 transcript fee is assessed for each issuance. Transcript request forms are available in the Office of Registration and Records and on the myCapitol portal.

Capitol Technology University will neither issue a transcript that reflects only part of a student's record nor make copies of transcripts on file from other colleges or universities. Federal guidelines prohibit the faxing or emailing of grades and transcripts.

Unofficial transcripts are available at any time with proper photo identification if the student's financial account is current.

Summer Session

The undergraduate summer semester is composed of 8- and 11-week sessions with a week for final examinations. All summer sessions will contain the same amount of material normally covered during a semester. Class schedules will be modified to accommodate the shortened period. Please refer to the university calendar beginning on page 126 for the summer session schedule.

Graduate online courses offered in the summer session maintain the 8-week accelerated term and 16-week semester.

Identification Cards

All enrolled undergraduate students will receive a Capitol Technology University identification card. ID cards are required to check out laboratory equipment or library materials.

The student activity fee covers the cost of the original ID card. At the beginning of each semester, information about obtaining an ID card is posted on campus and online.

Graduate students may request an ID card from the Office of Student Life.

Scholastic Standing

Grading System

The quality of a student's academic performance is evaluated by letter grades that are assigned quality points as follows:

Grade	Standard	Quality Points
A	Excellent	4
B	Good	3
C	Average*	2
D	Below average**	1
F	Failing	0
I	Incomplete	0
NG	No grade	0
P	Pass	0
R	Repeat	0
S	Satisfactory	0
U	Unsatisfactory	0
V	Validation credit	0
W	Withdrawn (officially)	0
X	Audit	0
T	Transfer credit	0

*A grade of C shows minimum expectations have been met at the graduate level.

**Grades of D will not apply toward graduate program requirements.

Grade Point Average

At the end of each semester, averages are computed for each student's record to indicate the general level of his or her academic standing. The first is the scholarship level for the semester. The second is the cumulative grade point average, indicating the scholarship level for all work taken at the university to date.

In cases where a student retakes a course, only the highest grade is used in computing the CGPA. The previous grade remains on record as information only. To graduate, undergraduate students must have a minimum 2.0 CGPA and a 2.0 GPA in their degree program. Graduate students must have a minimum 3.0 CGPA and a 3.0 GPA in their current degree program.

Incomplete Grades

An incomplete (I) grade will not be given except in the case of a true emergency that can be documented by medical records, death certificates, etc. Even if a true emergency exists, a student will not be allowed an extension (an I grade) unless that student has been attending classes and has kept up with the work before the emergency.

When an I grade is submitted, the professor will complete an incomplete grade form in the Office of Registration and Records explaining the reasons for the I grade and listing the student's grades in the course. The student must then complete the work by the end of the fourth week of the next term, or the I will be converted to an F (unless the professor has specified that the I be converted to a C or D). After six months, the Academic Affairs Council must approve changes in grades.

No Grade Mark

When it is not appropriate to award a grade, a mark of NG will be given. NG grades are not calculated in the student's term or CGPA.

Grade Reports

Grade reports are available at https://mycapitol.CapTechU.edu within three weeks after the last day of final exams. Students who want to have grades sent to sponsors must complete the proper request form available in the Office of Registration and Records or online. Federal regulations prohibit the use of phone, email or fax for official grade distribution.

Grade Appeal

Students who believe their posted grade is incorrect should speak directly to the professor. If the student and professor cannot

resolve the issue in a satisfactory manner, the student may write a letter clearly explaining the situation to the dean of academics. If the dean of academics and student are unable to resolve the issue in a satisfactory manner, the student may appeal in writing to the vice president for academic affairs. The vice president will review the situation and may seek the advice of the Academic Affairs Council. The decision of the vice president is final and no further review will be granted. All appeals must be filed by the fourth week of the next term.

Grade Changes

Occasionally, a grade must be changed as errors do occur. However, grade changes will not be accepted later than six months after a term has ended; therefore, if a student truly feels that a mistake has been made, he or she must investigate as soon as possible after the grade is issued. (see Grade Appeal above)

Dean's List for Full-time Students

Full-time undergraduate students who have GPAs of 3.5 or higher, and no failing grades for the semester, qualify for the dean's list. Dean's list designation is included on the student's permanent record.

Dean's List for Part-time Students

Part-time undergraduate students taking at least six semester credits, who have GPAs of 3.5 or higher and no failing grades for the semester, qualify for the dean's list for part-time students. Dean's list designation is included on the student's permanent record.

Academic Performance

Academic Standing

Students seeking a bachelor's or associate degree are in good academic standing if they have a cumulative grade point average of at least 2.0 in their degree program and are not on academic suspension. Students seeking a master's or doctoral degree are in good academic standing if they have a CGPA of at least 3.0 and are not on academic suspension.

Repeating a Class

A specific course may be repeated twice in order to improve a grade or replace a W or X. Therefore, a student may take a specific course only three times. Three-time enrollment is limited to a maximum of five different courses during a student's academic career. The higher grade is used and the lower grade is omitted in computing the CGPA. All grades are recorded on the student's transcript.

Any student who has taken a course required for their degree three times and has not achieved a satisfactory grade will be dismissed from that academic program. The dismissed student is permitted to apply for any other program that does not require that specific course. An academically dismissed student with extenuating circumstances can appeal in writing to the dean of academics for recommendation to the vice president of academic affairs.

Satisfactory Academic Progress for Students Receiving Financial Aid

Undergraduate and graduate students receiving federal aid must meet satisfactory academic progress (SAP) standards or risk the cancellation of financial awards and repayment of funds already received. See page 25 for the policy.

Academic Probation

Academic probation alerts students that they are in academic trouble and will be suspended from the university if their GPA and CGPA are not brought up to good academic standing (see above).

Undergraduate students are placed on academic probation under the following conditions:

- If a student registers for MA-005 or EN-001 and does not complete the course with a P
- If the CGPA of an undergraduate student with fewer than 30 attempted credits falls below 1.7
- If the CGPA of an undergraduate student with more than 30 attempted credits falls below 2.0.

Undergraduate students on academic probation must have a mandatory meeting with their advisor before registration and may not register for more than 12 semester credits, or no more than four courses.

Master's degree students whose cumulative GPA falls below 3.0 are placed on last warning. Students on academic probation will be given three semesters (registered for coursework) to raise their CGPA to 3.0 and must consult with their advisor on the best course options.

Doctoral students must maintain a 3.0 GPA. A grade of C or below is not acceptable. A student who receives a C or lower in any course must repeat that course, achieving a B or higher before moving on in the program. Students failing to successfully achieve a grade of B or higher in a single course after three attempts will be dismissed from the program. A student whose cumulative grade point average falls below 3.0 will be placed on academic probation. Probation will be lifted when the student achieves a cumulative GPA of 3.0. Students failing to meet any of these criteria will be dismissed from the doctoral program.

Academic Suspension

Undergraduate students who have not completed the prerequisites for MA-110 or MA-114 and EN-101 through placement testing, or successful completion of MA-005 and EN-001 after attempting 24 credit hours, will be suspended from the university until it is demonstrated to the faculty that they can achieve and maintain good academic standing at the university level.

Undergraduate students whose cumulative GPA has been below 2.0 for three consecutive semesters will be suspended from the university for one academic semester after which they may return to the university. Students suspended from the university are not relieved of their financial obligations.

Upon return, students will remain on probation and must achieve and maintain good academic standing or be suspended from the university until it is demonstrated to the faculty that they can achieve and maintain good academic standing at the university level. To demonstrate to the faculty that a student can achieve and maintain good academic standing at the university level, he or she must complete at least six academic courses (a minimum of 18 credits) with grades of a C or better at another accredited college or university. Before a student is readmitted to Capitol Technology University, the director of admissions will review his or her file.

Academic Dismissal

After a second suspension, undergraduate students who have been readmitted to Capitol Technology University after completing 18 credits at another institution must earn a 2.0 GPA each semester. If their GPA falls below 2.0 at any time, they will be dismissed and not permitted to return to Capitol Technology University. Graduate students who fail to reach the 3.0 requirement in the allowed period will be automatically dismissed and may not be readmitted to the university for at least one year after the effective date of dismissal.

Students dismissed from the university are not relieved of their financial obligations.

The U.S. Department of Veterans Affairs regional office will be notified if students receiving VA educational benefits are suspended or terminated. The dean of academics will consider re-entry requests on an individual basis from students who have been dismissed for unsatisfactory progress.

The Office of Registration and Records will maintain a record of each VA student's grades in accordance with VA regulations. A student can request official transcripts from the Office of Registration and Records as long as his or her financial accounts are current.

Any doctoral student who has been dismissed for failure to meet academic standards becomes eligible to reapply no sooner than one year after the dismissal date. Students will be required to submit a letter with the application, outlining how the reasons for the conditions that led to dismissal have been remediated and why the student is now confident that he or she will succeed in the program. The student must meet all the requirements of the degree existing at the time of readmission. Students are still subject to the time limit for completion (see pg. 19).

Disciplinary Dismissal

The continued enrollment of any student is dependent upon proper conduct. Failure to comply with the university's regulations, or conduct deemed by the faculty as inconsistent with general good order, is regarded as sufficient cause for irreversible dismissal. The university reserves the right to terminate a student's enrollment at any time for cause. Students dismissed from the university are not relieved of their financial obligations. Stu-

dents who are dismissed for academic dishonesty or other breaches of student conduct will not be considered for readmission.

Matriculation

Classification of Undergraduate Students

Freshman	29 semester credits or fewer
Sophomore	30-65 semester credits
Junior	66-95 semester credits
Senior	96 semester credits or more

Residency Requirements

A minimum of 15 semester credits, including 12 semester credits in the student's degree program, must be completed at Capitol Technology University in order to receive an associate degree. At least 30 semester hours of academic credit must be earned by direct instruction. Direct instruction does not include instruction through correspondence, credit for prior learning, cooperative education activities, practica, internships, externships, apprenticeships, portfolio review, departmental examinations or challenge examinations.

A minimum of 30 semester credits, including 18 semester credits in the student's degree program, must be completed at Capitol Technology University in order to receive a bachelor's degree. At least 60 semester hours of academic credit must be earned by direct instruction. Direct instruction means synchronous or asynchronous instruction for academic credit that allows regular interaction between student and instructor, such as lectures, laboratory instruction, interactive instructional television, delayed video online instruction and (if regular interaction is available from an instructor) independent study. An exception is made for undergraduate active duty military. The residency requirement is 25% of the degree requirements for campus based programs and 30% for online programs.

For all BS degrees, at least 27 credits must be 300 level or above to qualify for graduation.

Students who want to take courses at another institution for possible transfer after enrolling at Capitol Technology University must receive prior written permission from the dean of academics. Transfer credit approval forms are available at the Office of Registration and Records and online.

Graduate degrees must be completed in their entirety at Capitol Technology University, with the exception of students transferring courses in accordance with the transfer credit policy on page 20 of this catalog.

Students pursuing a Capitol Technology University certificate must complete all required coursework through Capitol Technology University.

Enrollment Status

Undergraduate

1-11 credits is considered part time
12-18 credits is considered full time

Master's

1-8 credits is considered part time
9 or more credits is considered full time

Doctoral

1-5 credits is considered part time
6 or more credits is considered full time

For federal and Veterans' benefits enrollment requirements, see page 30.

Graduation Requirements

Capitol Technology University conducts the annual commencement ceremony at the Laurel campus in May. Transcripts always reflect the exact semester the degree program is completed. The "date degree conferred" information on transcripts and diplomas coincides with the date of the May commencement ceremony for spring semester graduates and with the last day of classes in the semester for summer and fall semester graduates.

Undergraduate Requirements

Undergraduate students must have satisfactorily completed the curriculum requirements for their degree program with a CGPA and degree program GPA of at least 2.0 and must have satisfied the Capitol Technology University residency requirements as listed.

Undergraduate students who complete all degree requirements by the end of the summer session are permitted to take part in the commencement ceremonies as degree candidates. If a student is not enrolled for the summer by April 15, permission to participate as a degree candidate will not be granted.

Undergraduate students must file an application for graduation with the Office of Registration and Records no later than six months before the semester of completion. The student's file is reviewed and forwarded to the dean of academics for final approval. Students are subsequently notified of approval and status. Applications for graduation are available in the Office of Registration and Records and online. The graduation fee, due by April 15, cannot be waived.

Undergraduate students are considered degree candidates only when the above procedures have been completed. Students who change their plans for graduation must notify the Office of Registration and Records in writing.

Graduate Requirements

Graduate students must have a minimum 3.0 CGPA. Grades of D will not apply towards graduate program requirements. Graduate students must submit an application for graduation no later than the end of January to be considered and included in the May commencement ceremony. The graduation fee, due by April 15, cannot be waived. The form, available online and in the Office of Registration and Records, is required so that orders for diplomas and commencement regalia can be placed before commencement. Diplomas will be released only after graduation fees are paid.

Graduate students who complete all degree requirements by the end of the summer (Term I, Term II or in summer semester classes) are permitted to take part in commencement ceremonies as degree candidates. If a student is not enrolled for the summer by April 15, permission to participate as a degree candidate will not be granted.

Time Limit for Degree Completion

Graduate students are required to maintain satisfactory progress toward the completion of degree requirements, which must be accomplished within seven years. The seven-year period begins when the oldest course applied to the degree was completed. This includes any transfer credits from other institutions.

Doctoral students are required to maintain satisfactory progress toward the completion of course requirements, which must be accomplished within five years. Students then have an additional two years to complete their dissertation.

Graduation Clearance

In the final weeks of their last semester of study, students should check with the Business Office, the Office of Financial Aid, the Office of Residence Life and the Puente Library to be certain that they have no outstanding obligations. Diplomas and transcripts will not be issued for students who have outstanding library books or fines, outstanding balances in the Business Office, or for financial aid recipients who have not had exit interviews with the Office of Financial Aid.

Academic Honors

Honors are awarded and noted on the transcript of students who graduate with the following cumulative GPAs:

Undergraduate

3.9 - 4.0	summa cum laude
3.75 - 3.8999	magna cum laude
3.5 - 3.7499	cum laude

Master's

4.0	with honors

If an undergraduate student is completing more than one degree, the overall CGPA is used to calculate honors for the multiple degree programs.

If a master's student is completing more than one degree, the CGPA within their degree program is used to determine honors.

Honor Societies

Alpha Chi National Honor Society

The Maryland Beta Chapter represents the Alpha Chi National Honor Society at Capitol Technology University. Membership is based on demonstrated service to the university community, good reputation and character, as well as high academic standing. Juniors and seniors enrolled in one of the bachelor's degree programs at Capitol Technology University for at least one year and who rank among the top 10 percent of their class are eligible for election to the chapter by the faculty.

Alpha Chi offers opportunities for public performance at conventions; publication in

the Alpha Chi Recorder; leadership through National Council membership; financial assistance through National Benedict Fellowships, Nolle Scholarships and several regional scholarships; and participation in local chapter projects and activities.

Tau Alpha Pi National Honor Society

The Kappa Alpha Chapter represents the Tau Alpha Pi National Honor Society at Capitol Technology University. Membership requirements include successful completion of at least 55 semester credit hours and at least 24 semester credit hours at Capitol Technology University, enrollment in one of the degree programs, a CGPA of at least 3.5 for two consecutive semesters and a willingness to lead and serve in capacities beneficial to the university community. Members are elected for life. The chapter holds dinner meetings to recognize new members and encourages alumni participation.

Eta Kappa Nu National Honor Society

The Kappa Mu Chapter of Eta Kappa Nu at Capitol Technology University is a national honor society for electrical engineers. HKN was founded in 1904 and enjoys a membership of over 175,000, representing 198 chapters. This prestigious organization is the only honor society solely devoted to electrical engineering. A successful candidate possesses proven character, perseverance and the ability to excel. This organization extends membership to the top juniors and seniors in the fall and spring semesters. Officers are elected in the fall.

Sigma Beta Delta

The purposes of Sigma Beta Delta are to encourage and recognize scholarship and achievement among students of business, management and administration, and to encourage and promote personal and professional improvement and a life distinguished by honorable service to humankind. Membership in Sigma Beta Delta is the highest national recognition a business student can receive at a college or university with a Sigma Beta Delta chapter. To be eligible for membership, a business student must rank in the upper 20 percent of the junior, senior or master's class and be invited to membership by the faculty officers.

Transfer Credits

Undergraduate Transfer Policies

Unofficial transfer credit evaluations are completed during the admissions process in consultation with the academic departments. Once the transfer student is enrolled at Capitol Technology University, an official evaluation is conducted by the assistant director of registration and records in consultation with the academic departments and approved by the director of registration and records. The approved transfer credits are then added to the student's permanent academic record and the student will receive written notification of the official transfer evaluation from the Office of Registration and Records. Once students matriculate at Capitol Technology University, they must meet the academic standards for their degree program.

Capitol Technology University will consider credit for transfer from coursework completed at a regionally accredited institution, ABET-accredited program, or, in special cases, other qualified institutions acceptable to the standards of Capitol Technology University. Capitol Technology University will consider transfer credit for courses taken at an unaccredited institution on a probationary status, in which the student must complete a minimum of 24 credits at Capitol Technology University with a CGPA of 2.0 before the credits will transfer.

Coursework must also meet the following requirements:

- Courses must be relevant to the Capitol Technology University curriculum.
- Only a passing grade of C or higher will be considered for transfer (courses are evaluated and transferred individually).
- Grades do not transfer, therefore transfer credits are not used in computing the CGPA.
- Capitol Technology University credit requirements are based on the semester-credit system. Transfer credits from other institutions operating on other academic calendar systems will be converted to semester credits.
- The grade of D will not be accepted for credit even when it is part of a degree.
- Comply with Residency Requirements as stated on page 18.

Capitol Technology University will transfer a maximum of 70 semester-credit hours from any combination of the following:

- community or junior colleges*
- proprietary or technical schools
- the military
- College Level Examination Program (CLEP)
- Advanced Placement (AP)
- International Baccalaureate (IB)
- Massive Open Online Course (MOOC)**

* Credits transferred are limited to the first two years and up to 50% of the baccalaureate degree program.

** MOOC coursework will be considered for transfer credit if the courses are approved by the American Council of Education (ACE).

There is no maximum amount of credits that can be transferred from a four-year accredited institution as long as residency requirements are met.

Military Credits

Capitol Technology University will award credit for military courses based on the American Council on Education's Guide to the Evaluation for Educational Experiences in the Armed Forces and program relevancy. Applicants must present a certificate of completion and/or an official DD214 or DD295 to the Capitol Technology University Office of Registration and Records.

Industrial Courses

Capitol Technology University will not accept credits for courses taken at an industrial site unless the American Council on Education has approved the course. Students who have taken industrial courses may elect to take validation exams (see below).

Continuing Education Units

Capitol Technology University will not accept continuing education units (CEU) for transfer.

CLEP Tests

The official results of all CLEP exams must be submitted to the Office of Registration and Records no later than two semesters before completion.

Validation Exams

Students who can demonstrate competence in a subject without having completed the specific coursework, due to relevant work or life experience, may take a specially arranged validation examination. Not every course, however, lends itself to the validation process, and the dean of academics must grant permission for the examination to be given. Validation examinations are thorough and cannot be taken a second time.

After paying the proper fee in the Business Office, interested students may register for a validation exam in the Office of Registration and Records, where forms and procedures are available. Students who pass the validation examination receive a V on their transcript and the appropriate number of semester credits. No partial credit or quality points are awarded.

Professional Certifications

Capitol Technology University will consider transfer credit for industry recognized certifications that are relevant to the program curriculum.

Waived/Substituted Courses

In some circumstances, transfer credits may count toward a waived or substituted course. If a Capitol Technology University course is waived, the student must complete the equivalent number of credits in a related subject area to fulfill the requirements of the degree. If a course is substituted, the credit is transferred and the requirement is therefore considered complete. Waivers and substitutions are conducted by the assistant director of registration and records and approved in writing by the dean of academics.

Engineering Programs

Students transferring credits into the engineering programs must follow additional guidelines.

Credits for military, vocational or technical training may be used to satisfy some electronics- and technology-based freshman and sophomore level EL courses.

Such courses do not fulfill the objectives of engineering, engineering science, or social science courses; they may be used as engineering electives in the engineering programs.

Graduate Transfer Policies

Unofficial transfer credit evaluations are completed during the admissions process in consultation with the academic depart-

ments. Once the student is enrolled at Capitol Technology University, an official evaluation is conducted by the assistant director of registration and records in consultation with the academic departments and approved by the director of registration and records. The approved transfer credits are then added to the student's permanent academic record and the student will receive written notification of the official transfer evaluation from the Office of Registration and Records.

Depending on the program, a maximum of six to nine semester credits of comparable accredited coursework taken elsewhere may be applied toward a graduate degree. Only courses with a B or better will be accepted for transfer. Capitol Technology University will not accept continuing education units (CEUs) for transfer. Results from a certification exam may not be used for transfer. Validation exams for credit are not available at the graduate level. In some cases, military training and ACE-accredited government courses may be transferred. Official transcripts of such coursework may be submitted for evaluation of transfer credit. These materials should be submitted to the Office of Registration and Records for evaluation. The graduate programs will not award transfer credit for any course identified as correspondence. Credit that is part of a completed graduate degree may be used as transfer credit. Transfer credits are limited to six credits in 30-credit programs and nine credits in programs containing more than 30 credits except in the case of students who participated in selected NDU programs (see page 9 for details). Once the student enrolls at Capitol Technology University, all remaining credits must be completed at Capitol Technology University.

The time limit for degree completion applies to transfer credits. Therefore, any course that was taken more than seven years before the date of graduation will not fulfill graduation requirements at the master's level and will be removed from the student's transcript. At the doctoral level, courses taken within five years of admission will be considered for transfer. Once accepted, doctoral transfer credits do not expire. Transfer credits cannot be applied to any capstone or research-related course. Grades do not transfer, therefore transfer credits are not used in computing the CGPA.

Tuition and Fees

The following rates are in effect for the 2015-2016 academic year beginning fall 2015 and continuing through summer 2016. Tuition rates are subject to change without notice.

Undergraduate Tuition

Engineering, Computer and Technology Degree Programs	
Full-time tuition, per semester (12-18 credits)	11,394
Full-time credits above 18 (per credit)	950
Part-time 1-11 credits (per credit)	750
Audited courses (per credit)	750
Southern Maryland Higher Education Center (per credit)	636
Business and Management Degree Programs	
On-campus and Online (per credit)	411
Independent Study (per credit)	495
Southern Maryland Higher Education Center (per credit)	411
3-credit course, plus fees	1,278

Graduate Tuition

Master's Programs	
Online (per credit), plus fees	571
Independent study (per credit), plus fees	794
Southern Maryland Higher Education Center (per credit), plus fees	571
Online 3-credit course, including fees	1,758
Doctoral Program	
Per credit	824
3-credit course	2,472

Fees

Admissions	
Undergraduate (paper) application	25
Undergraduate online application	free
Master's program online application	free
Processing fee for international students	150
Doctorate application	100
Registration	
Late registration for continuing students	40
Drop/add (each form)	10
Deferred payment plan	30
Late payment	25
Returned check	40
Check stop payment request	40
Undergraduate On-campus Student Services, per semester	
Resident students	60
Full-time commuter students (12+ credits)	36
Part-time commuter students (1-11 credits)	10
Information Technology, per semester	
Undergraduate Full-time (flat fee, 12+ credits)	300
Undergraduate Part-time (per credit, 1-11 credits)	15
Southern Maryland Higher Education Center (per credit)	15
Master's (per credit)	15
Academic Services	
Transcripts (each)	10
Certificates (each)	25
Replacement of Diploma	75
Graduation (non-refundable)	
AAS degree programs	75
BS, MS, MBA, DSc degree programs	150
Additional degrees	75
Validation exam	250
Doctorate entrance exam	100
Business and Management Degree Subscription Fee (per academic year)	16
Campus Residence Halls	
Single room (per semester)	2,990
Double room (per semester)	2,590
Triple room (per semester)	2,190
Room reservation deposit, continuing students	50
Security deposit (refundable)*	200
Off-Campus University Housing	
Single room (per semester)	2,826

*See Guide to Residence Life to determine eligibility for refund.

Full-time Student Tuition Lock

Capitol Technology University offers a tuition-lock program for undergraduate students registered full time. Tuition is locked in from the students' first full-time semester and remains unchanged for up to five years.

To remain eligible for the tuition-lock rate, students must adhere to the following terms and conditions:

- Maintain continuous full-time enrollment during the academic year (minimum 12 credits per semester).
- Keep all financial accounts up to date. (Consult the academic calendar on page 126 for due dates.)
- Remain in good academic standing. (See page 16 for academic performance.)

If these terms are not met, the student will no longer be eligible for the tuition lock and will be subject to the prevailing tuition rate.

Payment Options

Undergraduate Payment Options

- Full payment at time of registration
- Deferred payment plan
- Financial aid (see page 25)
- VA Benefits (see page 30)
- Employer sponsorship

Undergraduate Deferred Payment Plan

The undergraduate deferred payment plan allows semester students to pay their tuition in three installments: one-third at registration, one-third on or before the end of the fourth week of classes and one-third on or before the end of the eighth week. Students taking 8-week classes may also pay their tuition in three installments: one-third at registration, one-third on or before the second week of classes and one-third on or before the sixth week of classes. The cost of the deferred payment plan is $30, which is due with the first installment.

Nonpayment of tuition deposits may result in registration cancellation. Failure to adhere to the arrangements of the deferred payment plan may result in immediate dismissal from the university. Students who abuse the deferred payment plan will not be allowed to defer their tuition in the future.

Students on academic last warning are not eligible to use the deferred payment plan and must pay their tuition in full at registration.

Undergraduate Employer Sponsorship

Undergraduate students who are sponsored by an employer or other appropriate third party must submit authorization forms to the Business Office at the time of registration. Sponsors will be billed directly. Tuition not covered will be the responsibility of the student.

Undergraduate Employer Tuition Reimbursement

Undergraduate Students who are reimbursed by their employers must pay in full or use the undergraduate deferred payment plan.

Master's Program Payment Options

- Full payment at time of registration
- Deferred payment plan
- Financial aid (see page 25)
- VA Benefits (see page 30)
- Employer sponsorship
- Employer reimbursement

Doctorate Program Payment Options

- Full payment prior to start of classes
- Financial aid (see page 25)
- VA Benefits (see page 30)
- Employer sponsorship
- Employer reimbursement

Master's Programs Deferred Payment Plan

Masters students are required to pay 50 percent of tuition upon registration. If tuition is not paid in full at the start of classes, students will be automatically enrolled in the deferred payment plan and assessed a $30 deferment fee. The remaining balance is due four weeks after classes begin. Nonpayment of tuition could result in cancellation of student registration.

Graduate Employer Sponsorship

Graduate students (masters and doctorate) who are sponsored by an employer or other appropriate third party must submit authorization forms to the Business Office at the time of registration. Sponsors will be billed directly. Tuition not covered will be the responsibility of the student.

Graduate Employer Tuition Reimbursement

Graduate students (masters and doctorate) who are reimbursed by an employer must submit authorization forms to the Business Office at the time of registration along with one third (1/3) of the tuition cost. Balance is due ten (10) days after classes end. Students who do not pay within the ten days will be subject to deferment fees and required to follow the standard payment options in the future.

Financial Aid

All students who receive financial aid are required to pay the remaining balance in full or follow the appropriate deferred payment plan. If funds have not been received by the university from a particular financial aid source, that amount will not be credited to the student's account and cannot be provided to the student, even if notification of the award has been received.

Book Vouchers

All students receiving financial aid in excess of tuition, fees and on-campus housing charges may be considered for a book voucher. The Business Office must receive all financial aid proceeds, including federal and private loans, for students to receive a book voucher.

Obligation for Payment

Tuition and fees for all students become an obligation in accordance with the provisions of the refund schedule in this section. Failure to pay any debt when due to the university is considered sufficient cause to bar the student from classes or examinations or to withhold diploma, scholastic certificate or transcript of record. Students with outstanding accounts will be sent to collections. Collection or litigation expenses associated with this account are the responsibility of the student. Students whose accounts are past due one semester will be notified that their accounts are in jeopardy of being referred to a collection agency.

Refund Policy

Dropping or Withdrawing from Classes

It is the students' responsibility to officially drop any class in which they are enrolled. This includes situations in which the student never attended the first class meeting. Never attending or ceasing to attend classes does not constitute an official withdrawal or relieve students of their financial obligation to Capitol Technology University.

Full tuition refunds are available only to students who officially drop a class before the first day of classes. After the first day of classes, any student who drops or withdraws from class will be subject to the tuition refund schedule, outlined below. Refunds are effective on the date the drop or withdrawal is submitted to the Office of Registration and Records.

Refunds are computed according to the following schedule and are a percentage based on the full tuition amount for each course. The percentage listed equates to the student refund in the event the balance was paid in full before the start of class. Students on company contract may be personally responsible for the balance of their tuition, in the event their company only pays for completed courses.

Please refer to the published semester and term calendars beginning on page 126 of this catalog or online for specific dates of refunds.

Tuition Refund Schedules

8-week Term Courses

100%	Student drops before the first day of classes
75%	Student drops during the first week of classes
50%	Student drops during the second week of classes
25%	Student drops during the third week of classes
0%	Student drops after the third week of classes

16-week Semester Courses

100%	Student drops before the first day of classes
75%	Student drops during the first or second week of classes
50%	Student drops during the third week of classes

25% Student drops during the fourth week of classes
0% Student drops after the fourth week of classes

Federal Return of Funds Policy

The Financial Aid Office is required by federal statute to recalculate federal financial aid eligibility for students who withdraw, drop out, are dismissed or take a leave of absence before completing 60% of a payment period or term. The federal Title IV financial aid programs must be recalculated in these situations.

If a student leaves Capitol Technology University before completing 60% of a payment period or term, the financial aid office recalculates eligibility for Title IV funds. Recalculation is based on the percentage of earned aid using the following Federal Return of Title IV funds formula:

Percentage of payment period or term completed = the number of days completed up to the withdrawal date divided by the total days in the payment period or term. (Any break of five days or more is not counted as part of the days in the term.) This percentage is also the percentage of earned aid.

Funds are returned to the appropriate federal program based on the percentage of unearned aid using the following formula:

Aid to be returned = (100% of the aid that could be disbursed minus the percentage of earned aid) multiplied by the total amount of aid that could have been disbursed during the payment period or term.

If a student earned less aid than was disbursed, the institution would be required to return a portion of the funds and the student would be required to return a portion of the funds. Keep in mind that when Title IV funds are returned, the student borrower may owe a debit balance to the institution.

If a student earned more aid than was disbursed to him/her, the institution would owe the student a post-withdrawal disbursement that must be paid within 120 days of the student's withdrawal.

Refunds are allocated in the following order:

Unsubsidized Direct Stafford Loans (other than PLUS loans)
Subsidized Direct Stafford Loans
Federal Perkins Loans
Direct PLUS Loans
Federal Pell Grants for which a return of funds is required
Academic Competitiveness Grant
National SMART Grant
Federal Supplemental Opportunity Grants for which a return of funds is required

According to federal regulation, a financial aid student who receives all Fs during a period of enrollment is considered not to have attended any of his or her classes; therefore, all financial aid received for that period of enrollment must be returned to the Department of Education. Financial aid will not have to be returned to the federal government if at least one of the student's professors verifies that the student has been in class and really earns the failing grade. The return of financial aid does not relieve the student of financial obligations.

Financial Aid

Capitol Technology University understands that paying for college is a major hurdle for parents and students. To help families meet tuition and living expenses, the university offers a variety of financial assistance programs including loans, work-study, scholarships and grants to help cover tuition and living expenses. Regardless of income level, all degree-seeking students are encouraged to apply for assistance.

Financial aid is available to both full- and part-time undergraduate students who are U.S. citizens or eligible non-citizens. Audited courses, some repeated courses, and credit by examination are not counted as meeting enrollment requirements. A student receiving financial aid must demonstrate satisfactory progress toward degree completion.

The Capitol Technology University student handbook contains additional information about financial aid at Capitol Technology University.

Application Procedures

One of the most important aspects of the financial aid process is to apply for assistance as early as possible. The application due dates are priority deadlines. Students who meet the priority deadlines enjoy the security of having their award authorization ready in time for class registration.

1. You must complete and submit the Free Application for Federal Student Aid (FAFSA) to apply for federal and state financial aid. Complete the application by March 1 or as far in advance of the starting term as possible. Applying online with FAFSA on the web at www.fafsa.ed.gov is faster and easier than using a paper FAFSA. Be sure to list Capitol Technology University on the FAFSA, School Code 001436 so the FAFSA information will be electronically forwarded to the university. A paper FAFSA can be obtained by requesting one from the Department of Education at 1-800-433-3243.

2. After reviewing your processed FAFSA data, the Office of Financial Aid will send an award letter listing the awards for which you are eligible.

3. Sign and return one copy of the award letter to the Office of Financial Aid. Students may also review, accept and decline their financial aid on the myFA portal. This portal is located within myCapitol and is available 24 hours a day from any location.

Renewal of Financial Aid

Financial aid is not automatically renewed, except as may be noted. The entire financial aid application process must be completed every year in order for your request for federal, state and institutional aid to be considered.

Enrollment Status for Financial Aid

Undergraduate and Graduate – Federal

- 6-8 credits is considered half time
- 9-11 credits is considered three-quarter time
- 12+ credits is considered full time

Undergraduate – Veterans

- 3 to 5 credits is considered part time
- 6 to 8 credits is considered half time
- 9 to 11 credits is considered three-quarter time
- 12+ credits is considered full time

Graduate – Veterans

- 3 or more credits taken during an 8-week term session is considered full time
- 3 to 5 credits taken during a 16-week semester is considered greater than one-quarter but less than half time
- 6 or more credits taken during a 16-week semester is considered full time

Continuing Eligibility

The Office of Financial Aid reserves the right to review or modify financial aid commitments at any time based on information affecting eligibility. This includes the availability of funds, changes in financial status, satisfactory academic progress, and changes in enrollment status.

Return of Federal Funds

Students who have received financial aid awards and withdraw from classes (officially or unofficially) may be required to return a portion of the federal funds. See the federal return of funds policy on page 26.

Federal Satisfactory Academic Progress (SAP) Standards

The Department of Education has passed a new federal satisfactory academic progress policy effective July 1, 2011.

This policy applies to both undergraduate and graduate students receiving federal financial student aid funds. This financial aid SAP policy is separate from the university's general satisfactory academic progress policy.

Under the Federal SAP policy there are two components: a qualitative SAP component (Grade Point Average) and a quantitative SAP standard (earned credit hours versus attempted credit hours). Students receiving federal student aid must be in compliance with both standards in order to be considered making financial aid satisfactory academic progress.

Repeated Coursework

A student may repeat any coursework previously taken in the student's program as long as the repeated course is not a result of more than one repetition of a previously passed course.

Undergraduate Student Requirements

Qualitative Standard (Grade Point Average Component)

A minimum cumulative Grade Point Average of 1.7 for undergraduate students who

have attempted fewer than 30 semester credit hours; a minimum Grade Point Average of 2.0 for undergraduate students who have attempted 30 semester credit hours or more or have completed their second academic year, whichever comes first. Transfer credits are also counted in the earned credit hours.

Quantitative Standard (number of credit hours attempted versus number of credit hours earned)

Under the quantitative component of the financial aid satisfactory academic progress standard, an undergraduate student must successfully complete coursework within a certain time frame. Charts showing the minimum number of credits you must earn each enrollment period and year of study are in the table below and on the university website.

Undergraduate Credit Hours

Half-time Students												
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Credits (5.5 credits per semester)	11	12	33	44	55	66	77	88	99	110	121	132
Three-quarter-time Students												
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**X**	**X**	**X**
Credits (7.5 credits per semester)	15	28	44	59	73	88	103	117	132	X	X	X
Full-time Students												
Year	**1**	**2**	**3**	**4**	**5**	**6**	**X**	**X**	**X**	**X**	**X**	**X**
Credits (11 credits per semester)	22	44	66	88	110	132	X	X	X	X	X	X

Additionally, for an undergraduate the time frame cannot exceed 150% of the published length of the program measured in academic years or credit hours attempted, as determined by the university. For instance, if the published length of your academic program is 120 credit hours, the maximum period must not exceed 180 (120 x 1.5) attempted hours.

To be in compliance, you must complete your credit hours as listed in the chart above.

Not meeting these standards will place you on financial aid warning for one semester.

A student on financial aid warning will receive financial aid for one more semester. However, before registering for classes the student must meet with the university advisor to develop a success plan and to receive approval for courses the student wishes to register for during the warning period.

A student under financial aid warning will have his/her financial aid terminated if the standards (GPA and credit hour) are not met following the warning period.

Graduate Student (Master's and Doctoral) Financial Aid Progress Requirements

Master's and Doctoral degree students receiving federal student aid

Graduate students must maintain a 3.00 Cumulative Grade Point Average. Not meeting this standard will place you on financial aid warning for one semester. A student on financial aid warning will receive financial aid for one more semester. However, before registering for classes the student must consult with their advisor on the best course options.

A student under financial aid warning will have his/her financial aid terminated if the GPA standard is not met during the warning period.

Graduate students must adhere to the time limit for degree completion. See page 19.

Financial Aid Termination–Undergraduate and Graduate (Master's and Doctoral) students

An undergraduate or graduate student whose financial aid is terminated following the warning period will not receive financial aid again unless the student has submitted an appeal requesting financial aid reinstatement. In your letter of appeal, you must explain the reason for your poor academic performance and provide medical documentation or other documents which help to explain your exceptional circumstances.

Your letter of appeal and accompanying documentation will be sent to the university's Financial Aid Appeals Committee for review. You will be notified in writing of the Committee's decision.

If your appeal is granted you will be placed in a probationary status for one semester.

Types of Financial Aid

The financial aid program at Capitol Technology University consists of grants, scholarships, loans and work-study employment. Detailed information about each aid program is available from the Office of Financial Aid.

Scholarships

The scholarship program at Capitol Technology University is designed to reward students for their academic accomplishments, leadership qualities or other special talents. The scholarships come from a variety of sources and donors, and each scholarship has its own set of criteria and annual value, ranging from $2,000 to full tuition. Scholarships are available to full-time undergraduate students enrolled for 12 credits or more per semester. Scholarships do not have to be repaid.

Institutional Scholarships

Each full-time undergraduate degree applicant is automatically considered for an institutional scholarship when applying for admission to the university. Initial institutional scholarship notification is sent by the Office of Admissions and is based on prior academic performance and SAT scores. For eligibility requirements, contact the Office of Admissions. All of the scholarships are annually renewable to recipients who maintain at least a 3.0 GPA and complete 24 credits each year.

Richard J. Heiman Scholarship

Awards range from $10,000 to $12,000. Named in memory of a dedicated member of the Capitol Technology University Board of Trustees, this scholarship is the highest offered by the university to new students.

Presidential Scholarship

Awards range from $7,000 to $9,000.

Board of Trustee Scholarship

Awards range from $4,000 to $6,000. The scholarship is named to recognize the service and support of the university Board of Trustees members.

Capitol Technology University Scholarship

This scholarship is offered to qualifying community university students who are transferring to Capitol Technology University, with awards ranging from $4,000 to $10,000.

Corporate and Foundation Scholarships

A number of corporations and foundations have invested funds with the university to be awarded annually to students meeting criteria specified by the donors, such as academic merit or financial need. Students continuing to meet the awarding criteria will be considered for subsequent scholarship awards. However, corporate and foundation scholarships are not automatically renewed.

Interested students must submit a completed scholarship application with a typed essay on an assigned topic between March 1 and March 30, before the academic year they want to be considered for a corporate and foundation scholarship. Applications are available between March 1 and March 30 on the university website under Financial Aid Office. For a complete listing of corporate and foundation scholarships and eligibility criteria, please consult the student handbook or visit the financial aid section online.

Maryland State Scholarships

Maryland students seeking Maryland state scholarships should complete the FAFSA by the March 1 filing deadline.

Students who are residents of other states should check with their state scholarship agencies for available scholarships, proper application procedures and deadline dates.

Grants

Grants are available to undergraduate students. Grants do not have to be repaid.

Richard A. Wainwright Grant

This grant provides support for students who have academic ability and demonstrate financial need. The Richard A. Wainwright Grant is the highest level of institutional grant offered to the most qualified students.

Pell Grant and Federal Supplemental Educational Opportunity Grant (SEOG)

These grants are funded by the federal government and are awarded by the Office

of Financial Aid to eligible students based on financial need as determined by the U.S. Department of Education.

Maryland Part-time Grant

These grants are funded by the state of Maryland and are awarded to Maryland residents enrolled on a half-time basis. Interested students enrolled on a half-time basis must complete the FAFSA. Funds are limited.

The Howard P. Rawlings Educational Excellence Awards

These grant program funds (Guaranteed Access Grant, Educational Assistance Grant and Part-time Grant) are awarded to full-time eligible students who filed their FAFSA before the state's March 1 deadline.

Loans

Loans are a serious financial obligation that must be repaid. Both undergraduate and graduate students can apply for loans. Students must be enrolled at least half time (six credits each semester) and cannot borrow more than their cost of attendance minus other financial aid received. The Federal Family Education Loan Program (FFELP) includes the Federal Direct Stafford and graduate PLUS loans for students and the Federal Direct PLUS loan for parents. Students can apply for loans online through Department of Education website: www.studentloans.gov

Federal Perkins Loan

The Federal Carl Perkins Loan program is for undergraduate and graduate students with exceptional financial need. Eligibility is determined by the Department of Education, based on the information provided on the FAFSA. Funds are limited and are not awarded to graduate students.

Alternative Loan Programs

These loans are available if additional funds are needed over and above what you receive under the federal, state, and institutional financial aid programs.

Work-Study Employment

On-campus jobs are available to both undergraduate and graduate students under the Federal College Work-Study and Capitol Technology University Work-Study programs. These work programs offer students the opportunity to earn money to meet educational and personal expenses during the year and to get on-the-job work experience.

Federal Work-Study

Federal Work-Study is funded by the federal government and awarded by the Office of Financial Aid to eligible students who have filed the FAFSA. It is the policy of Capitol Technology University that while class is in session during fall and spring, students cannot work more than 20 hours each week.

Capitol Technology University Work-Study

Students not awarded Federal Work-Study can consider employment under the Capitol Technology University Work-Study Program. Funding for this program is provided by various campus departments. Admitted students can contact the Office of Human Resources for more information. The employer decides the maximum hours students may work each week.

Other Aid Programs

Private Organizations

In addition to federal, state and institutional financial aid programs, there are private organizations that offer financial aid funds for a college education.

Many local clubs, religious organizations and other groups provide scholarships for deserving students. Students should visit their public library to research these possible sources or contact organizations such as the American Legion, 4-H clubs, Kiwanis, Jaycees, Chamber of Commerce, Girl Scouts and Boy Scouts. Do not overlook organizations connected with family, friends, and field of interest, such as the American Society of Professional Engineers or the Society of Women Engineers.

A scholarship packet has been developed by the Financial Aid Office to assist students. It is available for download at the university's website under Financial Aid Office and on myFA.

Veterans' Benefits

To qualify for financial aid, veterans' benefits or both students must be enrolled in a degree program and submit all necessary transcripts. Non-degree students are not eligible for veterans' benefits or federal financial aid. Certification and certificate courses are not eligible for veterans' benefits or federal financial aid, unless they are taken as part of an approved degree program. A veteran will not receive educational benefits for an audited course. Private loan programs can be used for these programs.

A counselor is available to assist veterans, active duty personnel and spouses, and children of deceased veterans who may be eligible for educational assistance through the VA. The counselor is located in the Office of Registration and Records.

Vocational Rehabilitation

Assistance is available to individuals with physical and/or mental disabilities. For further information, contact the Vocational Rehabilitation Service nearest you.

Additional Information

Course withdrawals (W) after the drop/add period are considered a non-completion of attempted credit hours.

An audit grade is not considered attempted coursework.

Incomplete grades are not included in the GPA calculation nor are they counted as attempted coursework. When the course is completed and a permanent grade is assigned the Office of Financial Aid will reevaluate the student's academic progress.

Students will not receive financial aid for audited courses.

The Capitol Technology University student handbook contains additional information about financial aid at Capitol Technology University.

Student Complaints

A student who wishes to file a complaint against the university should contact the Maryland Higher Education Commission, 6 N. Liberty St., Baltimore, MD 21201, 410-767-3301 and/or the university's accrediting agency: Commission on Higher Education, Middle States Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104 (215-662-5606).

Undergraduate Program Offerings

Bachelor of Science (BS) Degrees

- Astronautical Engineering
- Business Administration
- Computer Engineering
- Computer Engineering Technology
- Computer Science
- Cyber and Information Systems
- Electrical Engineering
- Electronics Engineering Technology
- Management of Cyber and Information Technology
- Mobile Computing and Game Programming
- Software Engineering
- Telecommunications Engineering Technology
- Web Development

Associate in Applied Science (AAS) Degrees

- Computer Engineering Technology
- Electronics Engineering Technology
- Telecommunications Engineering Technology

Programs of Study

Capitol Technology University's programs of study for associate in applied science and bachelor of science degrees are outlined beginning on page 37.

Undergraduate Certificates

Lower Division

- Object-Oriented Programming
- Programming and Data Management
- Web Programming

Upper Division

- Acquisitions Management
- Computer and Network Security
- Project Management
- Software Engineering
- Space Missions and Operations Specialist
- Website Development

Requirements for undergraduate certificates are outlined beginning on page 53.

Undergraduate Admissions

Degree-seeking Students

First-Time, Full-Time Freshman

A first-time, full-time freshman is defined as any applicant who has graduated from high school within one year of the proposed entrance term and is entering Capitol Technology University on a full-time basis. A full-time student must carry 12 or more credits per semester.

Application Requirements

1. File a formal application for admission as far in advance of the proposed entrance date as possible. An application for admission can be obtained from the Office of Admissions or online.

2. Enclose a $25 nonrefundable admissions processing fee with the application. (Applications remain on file for one academic year.) The application fee is waived for those students submitting electronic applications through the university website.

3. Forward the official high school transcripts to the Office of Admissions.

4. Submit SAT or American College Test (ACT) scores to the Office of Admissions.

Admissions Requirements

All applicants receive a comprehensive evaluation of their previous school records. Admissions decisions are based on the applicant's course preparation, high school grade point average (GPA), class rank and standardized test scores. Scholarship consideration is given based on GPA test scores, along with the admissions essay, letters of recommendation and a personal interview.

High school course preparation should include a minimum of four units of English, three units of mathematics (including plane geometry and Algebra II), two units of lab science and two units of social sciences.

Students whose GPA, course preparation and/or test scores do not meet the general admissions requirements may be further considered if they submit an admissions essay, letters of recommendation, placement tests and visit the campus for a personal interview.

The minimum GPA required for admission to Capitol Technology University is 2.2 on a 4.0 scale. The minimum SAT score is 800 composite. The minimum ACT score is 17 composite.

Undeclared Applicants

Students admitted to an AAS or BS degree who are undecided on their program study may complete up to 15 credits before they are required to declare a major. During this period, their account will reflect the 15-credit hold.

Engineering Applicants

Applicants to the engineering programs must have an additional unit of mathematics or entry into college calculus, an additional unit of laboratory science (physics or chemistry), an overall high school GPA of at least 2.8, and a minimum SAT score of 900 with at least a 500 on the Math section (or an ACT score of at least 19).

Engineering applicants who do not meet these additional criteria, but meet the general admissions criteria, will be accepted into an engineering technology program for their freshman year. After successful completion of the freshman year, students may transfer into the engineering program with academic dean approval.

Tuition Deposit

Upon acceptance, all full-time applicants are required to pay a nonrefundable $200 tuition deposit or $200 housing deposit to the university. The tuition deposit is credited to the applicant's first-semester tuition. The housing deposit is held until graduation, or permanent move to off-campus housing.

Full-Time Transfer Students

A full-time transfer student is defined as any applicant who is eligible to transfer 15 or more semester credits from an accredited higher education institution to Capitol Technology University and will attend on a full-time basis. A full-time student must carry 12 or more credits per semester.

Application Requirements

1. File a formal application for admission as far in advance of the proposed entrance date as possible. An application for admission can be obtained from the Office of Admissions or online.

2. Enclose a $25 nonrefundable admissions processing fee with the application. (Applications remain on file for one academic year.) The application fee is waived for those students submitting electronic applications through the university website.

3. Forward all official transcripts to the Office of Admissions. Applicants who are completing, or who have already earned, an associate or bachelor's degree from a regionally accredited university need only forward university transcripts. Applicants who have less than 30 college credits must forward an official high school transcript denoting graduation date or General Equivalency Diploma (GED) record and college transcripts, if applicable.

4. For transfer credit policies, see page 20 of this catalog.

Admissions Requirements

Full-time transfer applicants who have successfully completed an associate or bachelor's degree are generally accepted into Capitol Technology University once their application file is complete. Admissions requirements for all other students are based on previous academic coursework (including high school, college, proprietary institutions, the military or appropriate work experience), with an emphasis on postsecondary achievement. Students must be in good standing at all previous institutions. Students not in good standing are subject to further review.

If applicants are not eligible to transfer credits for MA-114 or EN-101, completion of a skills assessment test may be required.

Part-time Degree-seeking Students

A part-time degree-seeking student is defined as any student pursuing an undergraduate degree at Capitol Technology University on a part-time basis. A part-time student may carry 1-11 credits per semester.

Application Requirements

1. File a formal application for admission as far in advance of the proposed entrance date as possible. An application for admission may be obtained from the Office of Admissions or online.

2. Enclose a $25 nonrefundable admissions processing fee with the application. (Applications remain on file for one academic year.) The application fee is waived for those students submitting electronic applications through the university website.

3. Forward all official transcripts to the Office of Admissions. Applicants who are completing, or who have already earned, an associate or bachelor's degree from a regionally accredited college need only forward college transcripts. Applicants who have less than a degree or no college credits must forward an official high school transcript denoting graduation date or General Equivalency Diploma (GED) record and college transcripts, if applicable.

4. For transfer credit policies, see page 20 of this catalog.

Admissions Requirements

Part-time applicants who have successfully completed an associate or bachelor's degree are generally accepted into Capitol Technology University once their application file is complete. Admissions requirements for all other students are based on previous academic course work (including high school, college, proprietary institutions, the military or appropriate work experience). Students must be in good standing at all previous institutions. Students not in good standing are subject to further review.

If applicants are not eligible to transfer credits for MA-114 or EN-101, completion of a skills assessment test may be required.

Concurrent, Readmit and Other Types of Students

Concurrent Enrollment

Concurrent students are any qualified high school juniors or seniors who want to enroll in a limited number of courses at Capitol Technology University while completing their high school graduation requirements. Concurrently enrolled students are not eligible for financial aid.

Application Requirements

1. File a formal application for admission as far in advance of the proposed entrance date as possible. An application for admission may be obtained from the Office of Admissions or online.

2. Enclose a $25 nonrefundable admissions processing fee with the application. (Applications remain on file for one academic year.) The application fee is waived for those students submitting electronic applications through the university website.

3. Forward an up-to-date official high school transcript to the Office of Admissions.

4. Forward a letter of recommendation from the high school principal or guidance counselor.

5. Meet with an admissions counselor at Capitol Technology University for a personal interview.

Admissions Requirements

Once the application requirements have been completed, the applicant will be eligible for concurrent enrollment. Concurrent students are required to complete all prerequisites for courses in which they intend to enroll. Concurrent enrollment is considered a non-degree-seeking status, so the student will not be accepted into a specific degree program. If the student wants to apply for degree-seeking status after high school graduation, the student must complete the application requirements for a first-time, full-time freshman, outlined on page 32 of this catalog, and should do so as far in advance of the proposed start term as possible.

Concurrent students who want to enroll in MA-114 or EN-101 may be required to complete a skills assessment test.

Readmission

A readmit applicant is defined as any applicant who has previously completed any amount of coursework at Capitol Technology University, has not attended Capitol Technology University in at least one full academic year and wants to resume study. Students who were at any time in violation of the university's academic, financial or disciplinary regulations may be denied readmission. Readmitted students may be required to submit or resubmit required documents, such as official transcripts. Readmitted students will enter Capitol Technology University's degree program under the current graduation requirements and will be subject to current policies and procedures. A course audit will be completed to determine what coursework must be fulfilled for graduation. Readmission is contingent upon an application for admission, which may be obtained from the Office of Admissions or online, and review by the admissions staff.

Other Types of Students

Applicants who do not match any of the undergraduate types discussed herein should contact the Office of Admissions to determine the application and admissions requirements that apply. To reach the Office of Admissions, call 800-950-1992 or send email to admissions@CapTechU.edu.

Certificate Students

An undergraduate certificate student is any student pursuing one or more of Capitol Technology University's state-approved undergraduate certificates, maintaining less than 12 credits per semester and not pursuing a degree. Undergraduate certificate students are not eligible for financial aid.

Application Requirements

1. File a formal application for admission as far in advance of the proposed entrance date as possible. An application for admission can be obtained from the Office of Admissions or online.

2. Enclose a $25 nonrefundable admissions processing fee with the application. (Applications remain on file for one academic year.) The application fee is waived for those students submitting electronic applications through the university website.

3. Forward all official transcripts to the Office of Admissions. Applicants who are completing, or who have already earned, an associate or bachelor's degree from a regionally accredited college need forward only college transcripts. Applicants who have less than a degree or no college credits must forward an official high school transcript denoting graduation date or General Equivalency Diploma (GED) record and college transcripts, if applicable.

Admissions Requirements

Undergraduate certificate applicants who have successfully completed an associate or bachelor's degree are generally eligible to register for classes once their application file is complete. Admissions requirements for all other students are based on previous academic coursework (including high school, college, proprietary institutions, the military or appropriate work experience). Students must be in good standing at all previous institutions. Students not in good standing are subject to further review.

All certificates require that students have completed MA-110, MA-114 or have equivalent experience. All coursework must be completed through Capitol Technology University. Students must complete the specific courses listed for the certificate; no substitutions are permitted. Once the course requirements are completed, students must apply for the certificate in the Office of Registration and Records. A $25 processing fee is due with the certificate request. A student must have a minimum cumulative GPA of 2.0 in all certificate coursework to be awarded the certificate.

Non-degree-seeking Students

A non-degree-seeking student is any student pursuing a non-degree certification program or taking individual courses not applying to a degree. Non-degree study is not eligible for financial aid.

Application Requirements

1. File a formal application for admission as far in advance of the proposed entrance date as possible. An application for admission can be obtained from the Office of Admissions or online.

2. Enclose a $25 nonrefundable admissions processing fee with the application. (Applications remain on file for one academic year.) The application fee is waived for those students submitting electronic applications through the university website.

Admissions Requirements

Once the application and processing fee are received, applicants are notified of their acceptance and may register for classes during the appropriate registration period. Information about registration is continually updated online.

After successful completion of 15 semester credits at Capitol Technology University, non-degree students must complete the admissions procedure for degree-seeking status, or receive approval for continued non-degree status from the dean of academics.

International Students

An international student is defined as any applicant from a country other than the United States who will be pursuing an undergraduate degree program on a student visa. Eligibility requirements, listed below, must be met for acceptance. International students

are not eligible for institutional scholarships or federal financial aid.

Application Requirements

1. File a formal application for admission as far in advance of the proposed entrance date as possible. An application for admission can be obtained from the Office of Admissions or online.

2. Enclose a $200 nonrefundable admissions processing fee with the application. (Applications remain on file for one academic year.)

3. Verify that you meet the academic and financial requirements stated below.

Academic Requirements

Submit certified transcripts (with English translations) of secondary school and/or college records, or examination results when periodic grades are not used for measurement purposes. The university may require that you have your transcripts evaluated by a recognized credential evaluation service.

Applicants should have two years of college preparatory mathematics, such as algebra, geometry and trigonometry.

English proficiency for direct admission into a degree program:

1) TOEFL paper-based test score of 550 or an internet-based test score of 79, or 2) proof of completing a specified level of proficiency at an English language school, or 3) satisfactory completion of English courses at an accredited university or college within the United States.

Financial Requirements

International students must submit evidence of sufficient financial resources for living and educational expenses. Support documents must be dated within the last six months. Proof of financial support can be in one of the following forms:

A letter of sponsorship or scholarship from a government agency or corporation. This letter of sponsorship must be an original and outline specific billing procedures.

Complete the declaration and certification of finances form. This form must be accompanied by supporting bank statements or employment verification. Include signatures or original letters of support from each sponsor.

Students who have not provided valid evidence of sponsorship from a government agency or corporation must make a tuition deposit of $500 prior to formal acceptance and issuance of I-20.

Applicants can expect an answer from the university three to five weeks after receipt of all necessary documents. All international students must join the university health insurance program, unless adequate coverage is proven.

Astronautical Engineering

The Astronautical Engineering program is structured to provide students with a balance between theory and practice. Students receive hands on design experience via the university's high altitude balloon payload program, course assignments, laboratory exercises and the Space Operations Institute. The focus is on spacecraft and ground systems design rather than research.

The main objectives of the program is to produce skilled systems oriented astronautical engineers to support the needs of NASA and the aerospace industry.

In order to achieve this objective, students study space systems engineering, orbital mechanics, spacecraft subsystems, spacecraft attitude and control, autonomous ground systems as well as other areas of satellite mission planning, design and operations. Graduates have the ability to work on multidisciplinary teams, meet the expectations of employers of astronautical engineers, and pursue an advanced degree if desired.

All engineering majors must take courses in humanities and social science to broaden their understanding of professional and ethical responsibilities and impact of their engineering solutions in a global context.

All bachelor of science students must complete a capstone where they propose, design, develop and deliver a satellite mission plan or other space related project.

Course Requirements

Bachelor of Science 130/131 Credits

Course		*Credits*
Computer Sciences		4 Credits
CS-150	Intro to Programming Using C	4
Engineering		45 Credits
AE-150	Introduction to Space	3
AE-311	Spacecraft Systems	3
AE-350	Autonomous Ground Systems	3
AE-351	Orbital Mechanics	3
AE-361	Introduction to Satellite Imaging	3
AE-411	Space Systems Engineering	3
AE-454	Spacecraft Dynamics and Control	3
AE-455	Satellite Communications	3
AE-458	Senior Project in Space Science	3
EE-309	Circuit Design and Simulation	3
EE-453	Control I	3
AE-463	Spacecraft Simulations	3
Astronautical Engineering electives (3)*		9
English Communications		9 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Technical Research	3
Humanities and Social Sciences		19 Credits
FS-100	Freshman Seminar	1
HU-331 or HU-332	Arts and Ideas	3
SS-351	Ethics	3
Humanities electives (2)*		6
Social Sciences electives (2)*		6
Mathematics and Sciences		36 Credits
CH-120	Chemistry	3
MA-230	Intro to MATLAB	3
MA-261	Calculus I	4
MA-262	Calculus II	4
MA-263	Calculus III	4
MA-340	Ordinary Differential Equations	3
MA-360	Laplace and Fourier Analysis	3
PH-261	Engineering Physics I	4
PH-262	Engineering Physics II	4
PH-263	Engineering Physics III	4
Technical Courses		18 Credits
EE-159	Circuit Theory	4
EL-200	Electronic Devices and Circuits	4
EL-204	Digital Electronics	3
EL-250	Advanced Analog Circuits	4
EL-261	Introduction to Communications Circuits and Systems	3

*See appropriate department for approved list.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Business Administration

The business administration (BA) curriculum provides students with the knowledge necessary to integrate business, analytical and decision-making skills into a culturally, politically, socially and demographically diverse environment. Graduates will bring to the job market the ability to effectively apply the acquired skills and knowledge (theory, tools and models) to everyday work situations of current or future employers. The goals of the program are to give students an understanding of how private and public sector organizations function effectively and efficiently. Students will gain a clear picture of how the functional business areas work together to achieve organizational success in a global environment. Course content builds a solid business and management foundation to include marketing, accounting, finance, information technology and human resource management. The combined required and elective courses provide students with a breadth of skills important in today's technology-driven business climate.

Course Requirements

Bachelor of Science **120/121 Credits**

Course		*Credits*
Business Administration		33 Credits
BUS-200	Business Communications	3
BUS-270	Financial Accounting I	3
BUS-271	Financial Accounting II	3
BUS-280	Macroeconomics	3
BUS-281	Microeconomics	3
BUS-376	Marketing Principles	3
BUS-378	Legal Environment of Business	3
BUS-384	Production and Operations Management	3
BUS-386	Organizational Theory and Behavior	3
BUS-410	Strategic Management	3
BUS-458	Senior Project	3
Business Fundamentals		18 Credits
BUS-174	Introduction to Business and Management	3
BUS-275	Human Resource Management	3
BUS-279	Introduction to Leadership	3
BUS-283	Managerial Accounting	3
BUS-372	Financial Management	3
BUS-454	International Business	3
English Communications		9 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Technical Research	3
General electives		15 Credits
General electives (5)*		15
Humanities and Social Sciences		19 Credits
FS-100	Freshman Seminar	1
HU-331 or HU-332	Arts and Ideas	3
SS-351	Ethics	3
Humanities/History/Philosophy electives (2)*		6
Social Sciences electives (2)*		6
Information Technology		12 Credits
BUS-250	Database for Managers	3
BUS-301	Project Management	3
BUS-362	Information Systems for Managers	3
SE-321	Human-Computer Interaction	3
Mathematics and Sciences		15 Credits
BUS-400	Research Methods	3
MA-110	Business Math I	3
MA-111	Business Math II	3
MA-128	Introduction to Statistics	3
Science elective		3

Recommended Electives

Group One

CS 100	Introduction to Programming Logic
BUS 240	Introduction to Business Intelligence
BUS 246	Quantitative Methods for Business Analytics
BUS 310	Data Mining for Effective Decision Making
BUS 393	Consumer Analytics

Group Two

BUS 379	Integrated Marketing Communication
BUS 385	Marketing Information Technology
BUS 393	Consumer Analytics
BUS 395	Marketing Process and Strategy
BUS 443	Marketing Analytics: Decision Making in the Information Age

Group Three

BUS 289	Entrepreneurship and Small Business Management
BUS 290	Corporate Entrepreneurship
BUS 373	Entrepreneurial Finance and Venture Capital Investment
BUS 377	Entrepreneurial Marketing and Selling
BUS 401	New Product Development

Computer Engineering

The computer engineering (CE) program is structured to teach students to design and program computers and computer-based systems, including the latest embedded technology. The main objective of the computer engineering program is to produce practical design engineers who will be capable of analyzing the technical needs of society, and to create the next generation of integrated hardware and software solutions to meet systems requirements. CE majors study digital systems, computer organization and architecture, software design and testing, operating systems and programming languages, microcontroller systems, and the latest programmable chip technology. All engineering majors must take courses in humanities and social science to broaden their understanding of professional and ethical responsibilities and the impact of their engineering solutions in a global context. All students complete a capstone course in which they propose, design, build, test and deliver a computer-based system.

Course Requirements

Bachelor of Science **131 Credits**

Course		*Credits*
Computers and Programming		19 Credits
CS-150	Introduction to Programming Using C	4
CS-200	Programming Using C++	3
CS-220	Database Management	3
CS-351	Assembly Language Programming	3
CT-152	Introduction to Unix	3
CA-418	Operating Systems	3
Engineering		30 Credits
EE-304	Digital Design I	3
EE-354	Digital Design II	3
EE-362	Microcontroller System Design	3
EE-364	Computer Architecture	3
EE-404	Large-Scale Digital Design	3
EE-452	Advanced Microcontroller System Design	3
EE-458	Senior Project	3
EL-452	Automated Test Systems	3
Computer or Engineering electives (3)*		9
English Communications		9 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Technical Research	3
Humanities and Social Sciences		22 Credits
FS-100	Freshman Seminar	1
BUS-301	Project Management	3
HU-331 or HU-332	Arts and Ideas	3
SS-351	Ethics	3
Humanities electives (2)*		6
Social Science elective (2)*		6
Mathematics and Sciences		34 Credits
CH-120	Chemistry	3
MA-124	Discrete Mathematics	3
MA-261	Calculus I	4
MA-262	Calculus II	4
MA-340	Ordinary Differential Equations	3
MA-345	Probability and Statistics for Engineers	6
PH-261	Engineering Physics I	4
PH-262	Engineering Physics II	4
Physics or science elective		3
Technical Courses		17 Credits
EE-159	Circuit Theory	4
EL-200	Electronic Devices and Circuits	4
EL-204	Digital Electronics	3
EL-262	Microprocessors and Microassembly	3
IAE-201	Intro to Information Assurance	3

* See appropriate department for approved list.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Computer Engineering Technology

The Computer Engineering Technology (CET) program is structured to teach students to work at the interface between hardware and software linking digital technology to computer applications. The main objective of the program is to produce technologists who support industry in areas ranging from computers and computer manufacturing to networking and network programming. CET majors study software design and testing, operating systems programming languages, digital systems, computer organization and architecture, micro-controller systems, and the latest programmable chip technology. Students are trained to work in a wide range of technical jobs in the information technology industry. All bachelor of science students complete a capstone course in which they propose, design, build, test and deliver a computer-based system.

Associate in Applied Science Degree

The AAS degree program is designed to prepare graduates to work in technical positions of the computer technology industry. The program also provides further education for people who seek to broaden their base of knowledge and update their skills.

Bachelor of Science Degree

The BS degree program is designed to educate students for computer technology fields by providing a comprehensive understanding of computers. Academic instruction is augmented by requiring students to design and write programs, and through carefully planned laboratory exercises during which students build, interconnect, test, service and operate computer devices and systems.

Course Requirements

Associate in Applied Science

64/65 Credits

Course		*Credits*
English Communications		6 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
Humanities and Social Sciences		7 Credits
FS-100	Freshman Seminar	1
History/Humanities/Philosophy elective (1)*		3
Social Sciences elective (1)*		3
Mathematics and Sciences		20 Credits
MA-112	Intermediate Algebra	3
MA-114	Algebra and Trigonometry	4
MA-124	Discrete Mathematics	3
MA-261	Calculus I	4
PH-201	General Physics I	3
PH-202	General Physics II	3
Technical Courses		32 Credits
CS-150	Introduction to Programming Using C	3
CS-200	Computer Science Fundamentals II	3
CT-152	Introduction to Unix	3
EL-100	Introductory DC/AC Circuits	3
EL-200	Electronic Devices and Circuits	4
EL-204	Digital Electronics	3
EL-262	Microprocessors/Microassembly	3
TC-110	Introduction to Telecommunications	3
NT-100	Computer Architecture and Construction	3
NT-150	Computer Networking	3

Bachelor of Science

132 Credits

All requirements for the associate in applied science degree, plus the following:

Course		*Credits*
English Communications		3 Credits
EN-408	Writing Seminar in Technical Research	3
Humanities and Social Sciences		12 Credits
HU-331 or HU-332 Arts and Ideas		3
SS-351	Ethics	3
History/Humanities/Philosophy elective (1)*		3
Social Science elective (1)*		3
Mathematics and Sciences		13 Credits
CH-120	Chemistry	3
MA-128	Introduction to Statistics	3
MA-262	Calculus II	4
Math or Science elective (1)*		3
Technical Courses		39 Credits
CS-220	Database Management	3
CS-418	Operating Systems	3
CT-240	Network Routers and Switches	3
EE-304	Digital Design I	3
EE-354	Digital Design II	3
EE-362	Microcontroller System Design	3
EL-452	Automated Test Systems	3
IAE-201	Intro to Information Assurance	3
SE-458	Senior Project	3
TC-319	Network Sim & Modeling	3
Technical elective (1)		3
Technical elective (1) (2xx or above)		3
Technical electives (1) (3xx or above)		3

* See appropriate department for approved list.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Computer Science

The computer science (CS) program is structured to teach students to design and program computers and computer-based systems to meet the needs of all areas of society. The main objective of the computer science program is to produce practical computer system specialists who can apply computer theory and algorithmic principles to the design of computer-based systems that meet requirements. In order to meet this objective, CS majors study programming languages, computational science, algorithms and complexity, the architecture and organization of computers, software engineering, human-computer interaction, intelligent systems, information management, and the social and professional issues associated with the practice of computer science. All CS students must take courses in the humanities and social sciences to broaden their understanding of professional and ethical responsibilities and the impact of their CS solutions in a global context. All students complete a capstone course in which they propose, design, build, test and deliver a computer-based system.

Course Requirements

Bachelor of Science **129 Credits**

Course		*Credits*
English Communications		9 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Technical Research	3
Computers and Engineering Science		47 Credits
CS-130	Computer Science Fundamentals I	4
CS-150	Introduction to Programming Using C*	4
CS-220	Database Management	3
CS-225	Intermediate Java Programming	3
CS-230	Computer Science Fundamentals II	3
CS-310	Computer Algorithms	3
CS-316	Intelligent Systems	3
CS-330	iPhone Application Development	3
CS-351	Assembly Language	3
CS-405	Introduction to Software Design with UML	3
CS-418	Operating Systems	3
CT-152	Introduction to Unix	3
CT-376	Javascript	3
SE-458	Senior Project	3
Computer Science Electives		12 Credits
Computer Science electives (3)**		9
Humanities and Social Sciences		22 Credits
FS-100	Freshman Seminar	1
HU-331 or HU-332	Arts and Ideas	3
SS-272	Group Dynamics	3
SS-351	Ethics	3
History/Humanities/Philosophy elective (2)***		6
Social Science elective (1)***		3
Social Science/Management elective (1)***		3
Mathematics and Sciences		30 Credits
Science elective		3
EL-100	Introductory DC/AC Circuits	3
MA-114	Algebra and Trigonometry	4
MA-124	Discrete Mathematics	3
MA-128	Introduction to Statistics	3
MA-261	Calculus I	4
MA-262	Calculus II	4
PH-201	General Physics I	3
PH-202	General Physics II	3
Technical Courses		9 Credits
EL-204	Digital Electronics	3
EL-262	Microprocessors/Microassembly	3
TC-110	Introduction to Telecommunications	3

* Students who validate CS-150 or who place into Calculus I may replace this course with any technical course not already required for the CS degree.
**CT-240 is recommended for students interested in additional networking courses. CT-201 and CS-406 are recommended for students interested in constructing websites with dynamic webpages. CS-432 is recommended for students interested in taking CS-513 in the MSCS program.
***See appropriate department for approved list.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Cyber and Information Security

The cyber and information security (CIS) program is designed to meet current and anticipated needs for highly-skilled cybersecurity professionals, particularly as it relates to securing information and defending the information systems that store it. As society becomes increasingly reliant on information in electronic form, identifying and addressing vulnerabilities where information resides is vital to any public, private or government organization. The BSCIS degree develops and builds upon students' mastery in computer networking and programming, so that they become effective technologists for managing information security risk. In addition, BSCIS students complete courses by the end of their sophomore year that prepare them to pass industry certification exams to include A+, Network+, CEH, CISSP and Security+. By attaining a combination of the BSIA degree and one or more of the industry certifications, graduates will not only possess the professional knowledge required for a successful career in information assurance, but also have the credentials to prove it.

Course Requirements

Bachelor of Science **127/130 Credits**

Course		*Credits*
Programming and Computer		31 Credits
CS-130	Computer Science Fundamentals I	4
CS-150	Introduction to Programming Using C	3
CS-220	Database Management	3
CS-230	Computer Science Fundamentals II	3
CS-320	Database Administration	3
CS-418	Operating Systems	3
CT-152	Introduction to Unix	3
CT-206	Scripting Languages	3
CT-240	Internetworking with Routers and Switches	3
SE-458	Senior Project	3
Information Assurance Courses		27 Credits
IAE-201	Introduction to Information Assurance Concepts	3
IAE-301	Comprehensive Computer and Network Security	3
IAE-315	Secure System Administration and Operation*	3
IAE-321	Applied Wireless Network Security	3
IAE-325	Secure Data Communications and Cryptography	3
IAE-402	Introduction to Incident Handling and Malicious Code*	3
IAE-405	Malware Analysis / Reverse Engineering*	3
IAE-406	Digital Forensics and the Investigative Process*	3
IAE-410	Penetration Testing*	3
Management		6 Credits
BUS-174	Introduction to Business and Management	3
BUS-301	Project Management	3
Mathematics and Sciences		17 Credits
MA-114	Algebra and Trigonometry	4
MA-124	Discrete Mathematics	3
MA-128	Introduction to Statistics	3
MA-261	Calculus I	4
Science elective (1)**		3
English Communications		9 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Technical Research	3
Humanities and Social Sciences		18-19 Credits
FS-100	Freshman Seminar	1
HU-331 or HU-332	Arts and Ideas	3
SS-351	Ethics	3
History/Humanities/Philosophy electives (2)**		6
Social Sciences electives (2)**		6
General Electives		19-21 Credits

* Synchronous online environment only.
** See appropriate department for approved list.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Electrical Engineering

The electrical engineering (EE) program is structured to teach students a blend of theory and practice directed at engineering design, rather than research. The main objective of the program is to produce practical design engineers who are capable of analyzing the technical needs of society, and to create the next generation of electrical and electronic circuits to meet systems requirements. To meet this objective, students start in the program with basic circuit theory and laboratory projects that provide them a practical background. The students are then taught to use increasingly sophisticated design and testing techniques to conduct experiments, and interpret data. As students progress through the program they are taught more theoretical methods of circuit modeling and computer-aided circuit simulation tools that enable them to design, build, test and analyze sophisticated circuits and systems. There are elective courses that allow for specialization in communications systems, micro-controller system design, signals and systems, digital signal processing, microwave engineering, VHDL and telecommunications. All engineering majors must take courses in humanities and social science to broaden their understanding of professional and ethical responsibilities and the impact of their engineering solutions in a global context. All students complete a capstone course in which they propose, design, build, test, analyze and deliver a working prototype circuit to meet engineering standards and realistic constraints.

Course Requirements

Bachelor of Science **134 Credits**

Course		*Credits*
Electrical Engineering		46 Credits
EE-304	Digital Design I	3
EE-309	Circuit Design and Simulation	3
EE-359	High Frequency Circuit Design	3
EE-362	Microcontroller System Design	3
EE-406	Signals and Systems	3
EE-409	Network Analysis and Synthesis	3
EE-419	Electrostatics	3
EE-453	Control I	3
EE-456	Digital Signal Processing	3
EE-458	Senior Project	3
EE-459	Electromagnetic Field Theory	3
EE-461	Communications Theory	3
CT-150	Intro to Programming Using C	4
Engineering elective (2)*		6
English Communications		9 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Technical Research	3
Humanities and Social Sciences		19 Credits
FS-100	Freshman Seminar	1
BUS 301	Project Management	3
HU-331 or HU-332	Arts and Ideas	3
SS-351	Ethics	3
Humanities electives (1)*		3
Social Science electives (2)*		6
Mathematics and Sciences		39 Credits
CH-120	Chemistry	3
MA-230	Intro to MATLAB	3
MA-261	Calculus I	4
MA-262	Calculus II	4
MA-263	Calculus III	4
MA-340	Ordinary Differential Equations	3
MA-345	Probability and Statistics for Engineers	3
MA-360	Laplace and Fourier Analysis	3
PH-261	Engineering Physics I	4
PH-262	Engineering Physics II	4
PH-263	Engineering Physics III	4
Technical Courses		21 Credits
EE-159	Circuit Theory	4
EL-200	Electronic Devices and Circuits	4
EL-204	Digital Electronics	3
EL-250	Advanced Analog Circuits	4
EL-261	Introduction to Communications Circuits and Systems	3
EL-262	Microprocessors and Microassembly	3

*See appropriate department for approved list.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Electronics Engineering Technology

The electronics engineering technology (EET) program is structured to teach students a foundation in electronics technology with a strong emphasis on laboratory work and further the students' knowledge with more advanced studies in theoretical analysis and design. The main objective of the program is to produce technologists who support industry in areas ranging from circuit analysis to digital design to control and robotics. To meet this objective, EET majors study circuit design and simulation, network analysis and synthesis, transmission lines, micro-system design and fiber-optic communications with options for specialization in areas such as communications, computer design, control theory, micro-controllers and telecommunications. Students are trained to work in a wide range of practical electronics jobs and conduct design and theory work in the electronics field. All EET students must take courses in humanities and social science to broaden their understanding of professional and ethical responsibilities and the impact of their engineering solutions in a global context. All bachelor of science students complete a capstone course in which they propose, design, build, test and deliver a working electronic project.

Associate in Applied Science Degree

The AAS degree program is designed to provide students a foundation in electronics technology with a strong emphasis on laboratory work and to prepare graduates to work in technical positions of the electronics technology industry. Some theoretical courses are included to prepare students who are continuing with the bachelor's degree.

Bachelor of Science Degree

The BS degree program is designed to build on the AAS program with more advanced studies in theoretical analysis and design. Courses in design, modeling and simulation provide students with the necessary background to do design work in the electronics field and to pursue continued studies in order to avoid technical obsolescence.

Course Requirements

Associate in Applied Science

66 Credits

Course		*Credits*
English Communications		6 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
Humanities and Social Sciences		7 Credits
FS-100	Freshman Seminar	1
Humanities elective (1)*		3
Social Science elective (1)*		3
Mathematics and Sciences		17 Credits
MA-112	Intermediate Algebra	3
MA-114	Algebra and Trigonometry	4
MA-261	Calculus I	4
PH-201	General Physics I	3
PH-202	General Physics II	3
Technical Courses		36 Credits
CS-150	Introduction to Programming Using C	4
EL-100	Introductory DC/AC Circuits	3
EL-150	DC/AC Circuit Analysis	3
EL-200	Electronic Devices and Circuits	4
EL-204	Digital Electronics	3
EL-212	Transmission Lines	3
EL-250	Advanced Analog Circuits	4
EL-255	Control and Robotics	3
EL-261	Introduction to Communications Circuits and Systems	3
EL-262	Microprocessors/Microassembly	3
Technical elective*		3

* See appropriate department for approved list.
** Students who intend to stop at the associate degree may replace Calculus II with another math course.

Bachelor of Science **133 Credits**

All requirements for the associate in applied science degree, plus the following:

Course		*Credits*
English Communications		3 Credits
EN-408	Writing Seminar in Technical Research	3
General Electives		6 Credits
General electives (2)*		6
Humanities/Social Sciences		12 Credits
HU-331 or HU-332 Arts and Ideas		3
SS-351	Ethics	3
Humanities elective (1)**		3
Social Science elective (1)**		3
Mathematics and Sciences		16 Credits
CH-120	Chemistry	3
MA-262	Calculus II	4
MA-230	Intro to MATLAB	3
MA-340	Ordinary Differential Equations	3
MA-360	Laplace and Fourier Analysis	3
Technical Courses		36 Credits
EE-304	Digital Design I	3
EE-309	Circuit Design and Simulation	3
EE-354	Digital Design II	3
EE-362	Microcontroller System Design	3
EE-409	Network Analysis and Synthesis	3
EE-453	Control I	3
EE-458	Senior Project	3
EL-301	Advanced Communications Circuits and Systems	3
EL-307	Noise and Shielding	3
OP-301	Fiber Optic Communications	3

* Any course may be taken to satisfy the general elective requirement.
** See appropriate department for approved list.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Management of Cyber and Information Technology

The management of cyber and information technology (MCIT) program prepares students for positions in the information assurance industry or in businesses that rely on the use of sophisticated information resources and tools. Students are trained to understand the demands of technical jobs and to facilitate, from a managerial standpoint, an effective and efficient working environment for employees. The main objective of the program is to produce systems thinkers with both management expertise and technical competence. MCIT majors study principles of management, organizational behavior, production and operations management, business telecommunications analysis, marketing and personnel management. All students complete a capstone course in which they propose, design, test and deliver a management project.

Course Requirements

Bachelor of Science **121/122 Credits**

Course		*Credits*
Business Foundations		21 Credits
BUS-174	Introduction to Business and Management	3
BUS-200	Business Communications	3
BUS-270	Financial Accounting I	3
BUS-280 or BUS-281 Macro/Microeconomics		3
BUS-372	Financial Management	3
BUS-375	Human Resource Management	3
BUS-400	Research Methods	3
Business Administration		21 Credits
BUS-208	Internet and the Law	3
BUS-279	Introduction to Leadership	3
BUS-301	Project Management	3
BUS-386	Organizational Theory and Behavior	3
BUS-410	Strategic Management	3
BUS-454	International Business	3
BUS-458	Senior Project	3
Information Technology		34 Credits
BUS-250	Database for Managers	3
BUS-362	Information Systems for Managers	3
CS-130	Computer Science Fundamentals I	3
CS-150	Introduction to Programming Using C	3
CT-101	Computer Applications	3
CT-152	Introduction to Unix	3
IAE-201	Introduction to Information Assurance Concepts	3
IAE-301	Comprehensive Computer and Network Security	3
IAE-315	Secure Systems Administration and Operation	3
IAE-402	Introduction to Incident Handling and Malicious Code	3
TC-110	Introduction to Telecommunications	3
General electives (2)*		6
English Communications		9 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Technical Research	3
Humanities and Social Sciences		19 Credits
FS-100	Freshman Seminar	1
HU-331 or HU-332 Arts and Ideas		3
SS-351	Ethics	3
History/Humanities/Philosophy electives (2)*		6
Social Sciences electives (2)*		6
Mathematics and Sciences		12 Credits
MA-110	Business Math I	3
MA-111	Business Math II	3
MA-128	Introduction to Statistics	3
Science elective (1)*		3

* See appropriate department for approved list.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Mobile Computing and Game Programming

The mobile computing and game programming degree program offers students the opportunity to gain the skills and know-how needed for success in an increasingly critical arena of information technology. The objective of the mobile computing and game programming program is to produce programmers who can design and develop the next generation of mobile computer applications. Students in the program take courses in such specialized areas as iPhone application development and Javascript, while also reinforcing the fundamentals of computer science, programming and software design. Mobile computing and game programming majors must also fulfill general requirements in mathematics and science,. To help them in placing their studies and knowledge in a broader context, they must also take courses in the humanities and social science. All students complete a capstone course in which they design, build, test and deliver a mobile application.

Course Requirements

Bachelor of Science **126 Credits**

Course		*Credits*
Computers and Software		64 Credits
CS-130	Computer Science Fundamentals I	4
CS-220	Database Management	3
CS-431	Graphics and Game Programming	4
CS-225	Intermediate Java Programming	3
CS-230	Computer Science Fundamentals II	3
CS-305	Android Applications Development	3
CS-316	Intelligent Systems	3
CS-330	iPhone Application Development	3
CS-340	Game Programming	3
CS-356	Dynamic Web Page Development	3
CS-430	Game Programming/iPhone Platform	3
CT-102	Intro/Internet Applications	3
CT-152	Intro/Unix	3
CT-206	Scripting languages	3
CT-376	Javascript	3
CS-406	Web Programming Languages	3
IAE-201	Intro to Information Assurance	3
IAE-301	Comprehensive Computer/ Network Security	3
IAE-311	Mobile Computing Security	3
SE-321	Hunman Computer Interaction	3
SE-458	Senior Design Project	3
General Electives		6 Credits
Business		9 Credits
BUS-174	Intro to Business Management	3
BUS-208	E-Commerce and the Law	3
BUS-289	Entrepreneurship/Small Business Management	3
Humanities and Social Sciences		31 Credits
FS-100	Freshman Seminar	1
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Tech Research	3
HU-210	Game Design Theory	3
HU-331 or HU-332 Arts and Ideas		3
SS-351	Ethics	3
Humanities electives (2)*		6
Social Sciences electives (2)*		6
Mathematics and Sciences		16 Credits
MA-114	Algebra and Trigonometry	4
MA-124	Discrete Mathematics	3
MA-128	Introduction to Statistics	3
PH-201	General Physics I	3
PH-202	General Physics II	3

* See appropriate department for approved list.
** Any course may be taken to satisfy the general elective requirement.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Software Engineering

The software engineering (SE) program is structured to teach students to design and program computers and computer-based systems to meet the needs of all areas of society. The main objective of the program is to produce practical software engineers who can analyze and determine the needs of a system and apply engineering principles to create software and hardware solutions. SE majors study modern programming languages and applications, algorithm development, and software design and testing in the software component, computer organization and architecture, micro-controller system design and the latest programmable chip technology in the hardware portion, and modern approaches to knowledge acquisition using UML in both individual and team environments. All engineering majors must take courses in humanities and social science to broaden their understanding of professional and ethical responsibilities and the impact of their engineering solutions in a global context. All students complete a capstone course in which they propose, design, build, test and deliver a working software application.

Course Requirements

Bachelor of Science **131 Credits**

Course		*Credits*
Computers and Software		37 Credits
CS-130	Computer Science Fundamentals I	4
CS-150	Introduction to Programming Using C	3
CS-220	Database Management	3
CS-225	Intermediate Java Programming	3
CS-230	Computer Science Fundamentals II	3
CS-310	Computer Algorithms	3
CS-330	iPhone Application Development	3
CS-376	Javascript	3
CS-405	Introduction to Software Design with Unified Model Language	3
CS-418	Operating Systems	3
CT-152	Introduction to Unix	3
IAE-201	Intro to Information Assurance	3
SE-458	Senior Design Project	3
Engineering		21 Credits
EE-304	Digital Design I	3
EE-362	Microcontroller System Design	3
EE-364	Computer Architecture	3
SE-321	Human Computer Interaction	3
Software or Engineering electives (2)*		6
English Communications		9 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Technical Research	3
General Electives		6 Credits
General electives (2)**		6
Humanities and Social Sciences		19 Credits
FS-100	Freshman Seminar	1
HU-331 or HU-332 Arts and Ideas		3
SS-351	Ethics	3
Humanities electives (2)*		6
Social Sciences electives (2)*		6
Mathematics and Sciences		32 Credits
CH-120	Chemistry	3
MA-114	Algebra and Trigonometry	4
MA-124	Discrete Mathematics	3
MA-128	Introduction to Statistics	3
MA-261	Calculus I	4
MA-262	Calculus II	4
PH-261	Engineering Physics I	4
PH-262	Engineering Physics II	4
Science elective (1)*		3
Technical Courses		6 Credits
EL-204	Digital Electronics	3
EL-262	Microprocessors and Microassembly	3

* See appropriate department for approved list.
** Any course may be taken to satisfy the general elective requirement.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Telecommunications Engineering Technology

The telecommunications engineering technology (TET) program is structured to teach students to design, build, maintain, troubleshoot and expand networks of all types. The main objective of the program is to produce technologists who support industry in areas ranging from data communications and networking to routers and switches to network modeling and design. To achieve this objective, TET majors study digital electronics, noise and shielding, fiber-optic communications, microprocessors and micro assembly, and may specialize in either data communications and networking or RF and satellite communications. Students are trained to work in a wide range of telecommunications and computer networking jobs on both the technical and the design sides. TET majors must take courses in humanities and social science to broaden their understanding of professional and ethical responsibilities and the impact of their technological solutions in a global context. All bachelor of science students complete a capstone course in which they propose, design, build, test and deliver a working telecommunications project.

Associate in Applied Science Degree

The AAS degree program is designed to teach students about the design and construction of networks by giving them a broad foundational background in the field of telecommunications. Students at the AAS level will be able to construct and test telecommunications circuits and networks using many different types of test equipment. Some theoretical courses are included to prepare students who are continuing with the bachelor's degree.

Bachelor of Science Degree

The BS degree program is designed to build on the AAS program with more advanced studies in simulation, analysis and modeling of communications circuits and networks. Courses in optical communications, data communications and networking and Internet networks provide students with the necessary background to do network design and administration work and to pursue continued studies in engineering, engineering technology or information technology.

Course Requirements

Associate in Applied Science — 65 Credits

Course		*Credits*
English Communications		6 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
Humanities and Social Sciences		7 Credits
FS-100	Freshman Seminar	1
Humanities elective (1)*		3
Social Sciences or MIT elective (1)*		3
Mathematics and Sciences		17 Credits
MA-114	Algebra and Trigonometry	4
MA-128	Introduction to Statistics	3
MA-261	Calculus I	4
PH-201	General Physics I	3
PH-202	General Physics II	3
Technical Courses		35 Credits
CS-130	Computer Science Fundamentals	4
CS-150	Introduction to Programming Using C	3
CT-152	Introduction to Unix	3
CT-240	Internetworking with Routers and Switches	3
EL-100	Introductory DC/AC Circuits	3
EL-200	Electronic Devices and Circuits	4
EL-204	Digital Electronics	3
IAE-201	Introduction to Information Assurance Concepts	3
NT-100	Computer Architecture and Construction	3
NT-150	Computer Networking	3
TC-110	Introduction to Telecommunications	3

* See appropriate department for approved list.

Bachelor of Science — 129 Credits

All requirements for the associate in applied science degree, plus the following:

Course		*Credits*
English Communications		3 Credits
EN-408	Writing Seminar in Technical Research	3
General Electives		6 Credits
General electives (2)*		6
Humanities/Social Sciences		12 Credits
HU-331 or HU-332 Arts and Ideas		3
SS-351	Ethics	3
Humanities elective (1)**		3
Social Science elective (1)**		3
Mathematics and Sciences		13 Credits
CH-120	Chemistry	3
MA 128	Introduction to Mathematics	3
MA-262	Calculus II	4
MA-340	Ordinary Differential Equations	3
Technical Courses		30 Credits
CS-250	Intro to Network Programming in C	3
EL-261	Introduction to Communications Circuits and Systems	3
EL-307	Noise and Shielding	3
IAE-301	Comprehensive Network Security	3
OP-301	Fiber Optic Communications	3
TC-309	Network Simulation	
TC-312	Voice over IP	3
TC-359	Network Modeling and Design	3
TC-458	Senior Design Project	3
Technical elective (1)**		3

* Any course may be taken to satisfy the general elective requirement.
** See appropriate department for approved list.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Web Development

The web development (WD) degree program is structured to prepare students to understand and effectively respond to the entire spectrum of Internet issues and challenges, with a strong emphasis on web development. The main objective of the program is to produce well-rounded web development experts who can design the visual aspect of web sites on the front end while possessing the more technical development and programming knowledge that resides on the back end. Front end instruction includes HTML, Flash, Javascript and Javascript libraries (Jquery, Prototype, Scriptaculous), complemented by back end instruction that includes Unix, SQL, PHP, Java Server Pages, Java Servlets, and .NET (C#). Students also study courses in business and entrepreneurship to enable them to develop websites and support. Web development majors must take courses in humanities and social science to broaden their understanding of professional and ethical responsibilities and the impact of their web development solutions in a global context. All students complete a capstone course in which they propose, design, test and deliver a web-based project.

Course Requirements

Bachelor of Science **126 Credits**

Course		*Credits*
Computers		50 Credits
CS-130	Computer Science Fundamentals I	4
CS-150	Introduction to Programming Using C*	4
CS-220	Database Management	3
CS-230	Computer Science Fundamentals II	3
CS-225	Intermediate Java Programming	3
CS-321	Computer Human Interaction	3
CS-356	Dynamic Web Page Development	3
CT-102	Introduction to Internet Applications	3
CT-152	Introduction to Unix	3
CT-201	Multimedia Applications	3
CT-206	Scripting Languages	3
CT-376	Javascript	3
CT-406	Web Programming Languages	3
IAE-201	Intro to Information Assurance	3
IAE-301	Comprehensive Network Security	3
SE-458	Senior Design Project	3
English Communications		9 Credits
EN-101	English Communications I	3
EN-102	English Communications II	3
EN-408	Writing Seminar in Technical Research	3
General Electives		12 Credits
General electives (4)**		12
Humanities and Social Sciences		19 Credits
FS-100	Freshman Seminar in Computers	1
HU-331 or HU-332	Arts and Ideas	3
SS-351	Ethics	3
History/Humanities/Philosophy electives (2)		6
Social Sciences/Management electives (2)		6
Mathematics and Sciences		12 Credits
MA-112	Intermediate Algorithms	3
MA-124	Discrete Mathematics	3
MA-128	Introduction to Statistics	3
Science elective (1)		3
Option		12 Credits
Choose four related courses (4)**		12

* Students who validate CS-150 may replace this course with any technical course not already required for the WD degree.

**Examples of options:

Gaming option: HU-210, CS-305, CS-330, CS-430

IA option: CS-320, IAE-315, IAE-325, IAE-402

System hardware option: NT-100, NT-150, CT-240 and NT-250

Students may create their own option. Students should consult with an advisor in selecting an option.

All bachelor of science degrees require a minimum of 27 credits at the 300-level or above. For descriptions of required courses, see courses beginning on page 72.

Undergraduate Certificates

The undergraduate certificates are targeted at specialized jobs in distinct information technology and management fields. The courses required for these certificates are offered in a standard 16-week format. Consult the schedule of classes for more information. Students seeking an undergraduate certificate must complete all coursework at Capitol Technology University.

For descriptions of required courses, see courses beginning on page 68.

Acquisitions Management
(12 credits)

This upper-level certificate is designed to provide students with knowledge of the broad concepts and strategies of procurement and contract management, which contributes to the ability to make sound business decisions. Major topics include the foundations of pricing and negotiations, basic aspects of contracting, procurement of services and products, software acquisitions, and mergers and acquisitions.

Required Courses

BUS-301	Project Management	3
BUS-385	Federal Acquisitions Management	3
BUS-387	Mergers and Acquisitions	3
BUS-388	Software Acquisitions	3

Computer and Network Security
(13 credits)

This upper-level certificate provides students with a fundamental knowledge of general network security concepts, which can then be applied to an advanced training program in specific security software and platforms. Students learn the basics of practical and theoretical network and computer security. The first course introduces students to introductory computer programming to support the advanced courses. The remaining courses provide students with an understanding of computer and network security issues, including encryption, SSL, privacy issues, directory services protocols such as LDAP, intrusion detection, viruses, firewalls and network management.

Required Courses

CS-130	Computer Science Fundamentals I	4
IAE-201	Introduction to Information Assurance Concepts	3
IAE-301	Compr. Computer & Network Security	3
IAE-315	Secure System Administration and Operation	3

Object-Oriented Programming
(13 credits)

This lower-level certificate provides a solid grounding in object-oriented programming to students with no prior programming experience. Students learn to analyze and design programs from the object-oriented perspective. Implementing object-oriented solutions to problems in two languages, C++ and Java, helps to reinforce an understanding of object-oriented concepts from coupling and cohesion to inheritance and polymorphism. In addition, Java provides students with the tool necessary to implement graphical user interfaces as well as a variety of features and classes useful in webpage and Internet programming. C++ requires students to develop a good understanding of structures, such as lists, queues and trees, and to implement them using the classes defined in the C++ Standard Template Library.

Required Courses

CS-130	Computer Science Fundamentals I	4
CS-150	Introduction to Programming Using C	3
CS-225	Intermediate Java Programming	3
CS-230	Computer Science Fundamentals II	3

Project Management
(12 credits)

This upper-level certificate is built on core processes defined in the Project Management Body of Knowledge (PMBOK). The certificate consists of four core courses, which provide students the opportunity to learn the basic concepts and strategies of project management required to successfully manage projects in both government and private industry.

Required Courses

BUS-301	Project Management	3
BUS-302	Methods of IT Project Management	3
BUS-303	Project Management Competitive Advantage	3
BUS-375	Human Resource Management	3

Programming and Data Management
(13 credits)

This lower-level certificate provides a good understanding of how programmers store and manage computer data. Students learn the fundamental aspects of the storage and management of computer data. Courses in C++ and Java introduce the student to the object-oriented paradigm and the underlying principles of the structures and methods associated with data management. In addition, Oracle is used in the database management course, which introduces students to relational databases and the techniques for analyzing and designing database solutions. Finally, a course in advanced data structures teaches students the theory and underlying techniques used to store, search, sort and access computer data.

Required Courses

CS-130	Computer Science Fundamentals I	4
CS-220	Database Management	3
CS-225	Intermediate Java Programming	3
CS-310	Computer Algorithms	3

Software Engineering
(13 credits)

This upper-level certificate introduces students to relational databases software design, and user interaction with technology. Students learn the practical aspects of programming and database management, as well as the theoretical issues involved in analyzing, designing and implementing computer applications that are accessible, reliable and maintainable. The software engineering course allows students to apply basic engineering principles to help them understand software performance, modularity, portability and reliability. A course in human-computer interaction investigates the relationship between the functionality and usability of computer systems in order to maximize their efficiency by selecting appropriate input-output devices and interaction styles.

Required Courses

CS-130	Computer Science Fundamentals I	4
CS-230	Computer Science Fundamentals II	3
CS-310	Computer Algorithms	3
CS-405	Introduction to Software Design with Unified Modeling Language	3

Space Missions and Operations Specialist
(12 credits)

This upper-level certificate provides students with a general overview of satellites, including simple physics of satellite orbits and the history of NASA and scientific mission operations. Students will learn satellite design with emphasis on power management, heating and cooling considerations, telemetry and communications and control systems. Coursework includes the study of orbital mechanics and the physics of the instruments used to monitor and analyze the earth and atmosphere. Prerequisites for the certificate include an understanding of math through differential equations with basic engineering physics.

Required Courses

AE-150	Introduction to Space	3
AE-250	Ground Systems Engineering	3
AE-350	Autonomous Ground Systems	3
AE-411	Space Systems Engineering	3

Web Programming
(12 credits)

This lower-level certificate provides students the foundation to write programs that support transactions conducted over the Internet. Students learn about the web and the basic tools used for webpage construction, including HTML, DHTML, scripting, CSS and an overview of XML. The database management course provides students with an understanding of relational databases, how they are designed, how data is stored in them, and how that data can be accessed. The final two courses, Intermediate Java Programming and Web/ CGI Programming Using Perl, provide students with the programming techniques and tools needed to create truly dynamic webpages.

Required Courses

CT-102	Introduction to Internet Applications	3
CT-201	Multimedia Applications	3
CT-376	Javascript	3
CT-406	Web Programming Languages	3

Prerequisite: CT-115, CS-130 or equivalent.

Website Development
(12 credits)

This upper-level certificate is designed for students interested in building websites. Students learn a variety of tools and applications such as HTML, Java Script, ASP, PHP, Microsoft FrontPage and Macromedia Director used to build webpages and add multimedia content to them. The website construction course deals with website and browser requirements, platform selection issues, web server functions, client and server side applications, cookies and other topics. In the website administration course, students learn concepts in the use of software to monitor and optimize website operations, alternatives to CGI such as ASP and website security.

Required Courses

CT-152	Introduction to Unix	3
CS-130	Computer Science Fundamentals I	4
CS-220	Database Management	3
CS-320	Database Administration	3

Prerequisite: CT-115, CS-130 or equivalent.

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Graduate Program Offerings

Doctor of Philosophy (PhD) Degree

- Management and Decision Sciences

Doctor of Science (DSc) Degree

- Cybersecurity

Doctoral classes are taught in real-time, accelerated 8-week classes except for three residency courses which are held on campus over three weekends.

Master of Business Administration (MBA) Degree

Master of Science (MS) Degrees

- Astronautical Engineering
- Computer Science
- Cyber and Information Security
- Electrical Engineering
- Information Systems Management
- Internet Engineering

All master's degrees and certificates are taught online in real time alternating between regularly scheduled live lectures and asynchronous learning sessions. The majority of courses are offered in 8-week accelerated terms. However, some courses in the MSCS, MSIA and MSIE programs are offered only in the 16-week semester format. All courses in the MSEE program are the 16-week semester format.

Post-baccalaureate Certificates

- Acquisitions Management
- Client/Server and Wireless Devices
- Component Technologies and Online Collaboration
- Information Assurance Administration
- Information Technology
- Project Management
- Network Protection
- Security Management

Doctoral Admissions

Requirements

- Master's degree in information assurance, computer science, information technology or related field from a regionally accredited college or university
- Minimum of five years of direct work experience
- Three letters of recommendation
- Currently hold one of the following industry certifications: CISSP, GSE, CGEIT or CISM. Applicants who do not have one of these certifications must pass a comprehensive entrance exam. Information about the exam and how to register will be sent to students lacking a certification.

Application Deadline

All application materials must be submitted by the following dates to be considered for admission to the program:

Start	Application Deadline
Fall	July 1 (classes start late Aug.)
Spring	Oct. 1 (classes start early Jan.)

Once an applicant's file is complete, it will be sent to the Admissions Committee for review. Applicants will be notified of their acceptance status.

Master's Degree Admissions

Applications for admission are accepted at any time and are processed and reviewed upon receipt of all necessary documents, on a case-by-case basis. Students whose application packages are incomplete will be classified as decision-pending.

Full Acceptance Status

For full acceptance, students must have a completed undergraduate degree from a regionally accredited institution, with a cumulative GPA of no less than 3.0 on a 4.0 scale. In addition, students must also meet the program-specific prerequisites for their intended program.

Provisional Acceptance Status

Students who have not met the 3.0 undergraduate cumulative GPA requirements or do not meet all of the program specific prerequisites are provided an opportunity to gain full acceptance. Depending on the degree program, additional information may be requested. In this case, students are provisionally admitted and limited to three courses of enrollment. To achieve full acceptance, provisional students must maintain a 3.0 cumulative GPA in their first three graduate courses. Upon doing so, students are automatically converted to full acceptance status. If a provisional student fails to achieve a minimum 3.0 cumulative GPA after completing three courses, then he or she will be academically dismissed, and will not be permitted to enroll in any further courses.

Decision-Pending Status

Students with incomplete application packages (missing transcripts, missing essay, etc.) are classified as decision-pending until the application package is complete.

Decision-pending students who have been approved to register are limited to two courses of enrollment and are not permitted to enroll in a third class until their application is complete.

Program-Specific Prerequisites

Astronautical Engineering

- Bachelor of science in astronautical engineering with a minimum cumulative GPA of 3.0; or, a bachelor of science in a closely related field with minimum GPA of 3.0 and a minimum of three years of work experience
- A current resume
- Personal essay describing your vision for achieving your career goals in the field of astronautical engineering

Students who do not meet these requirements may still be considered for admission to the program under the provisional status. Additional documents such as letters of recommendation or an interview by a member of the faculty may be required. Applicants may also be required to take additional prerequisite courses.

Business Administration (MBA)

Applicants who possess an undergraduate degree in business are waived from completing MBA-600 "Fundamentals of Professional Management." All other MBA-students must complete it. MBA-600 provides a broad foundation in accounting, finance, economics and statistics.

Computer Science

- Bachelor of science in computer science or related field preferred, but not required
- Proficiency in computer topics including object oriented programming, multiple languages, algorithm development, operating systems, databases, software architecture, distributed programming and other advanced work
- Fluency in mathematics: Calculus I, Calculus II and Linear Algebra

Cybersecurity

Courses are written to accommodate students with backgrounds in computer information systems, computer networking, telecommunications, information technology, network security, or computer science. Students are expected to have a working knowledge of servers, routers, hubs, switches, TCP-IP, etc. CCNA, Security+, SSCP, or CISSP certifications provide an excellent foundation for preparation, but are not required.

Electrical Engineering

- Bachelor of science in electrical engineering is preferred, but not required
- Fluency in mathematics: Calculus I, Calculus II, Linear Algebra, Ordinary and Differential Equations, Laplace and Fourier Analysis, and Probability and Statistics for Engineers required
- Engineering and Science: upper level courses in Control Theory, Signals and Systems, Communication Theory and Microprocessors required. Students with a BSET or equivalent are likely missing these course pre-requisites, and can gain access to the curriculum by completing the summer bridge course, EE-500 Advanced Signals and Systems

Information and Telecommunications Systems Management

- Working knowledge of statistics, economics, finance and accounting
- An undergraduate course in each topic is preferred

Internet Engineering

- Working knowledge of object-oriented programming
- C++ or Java is preferred, but not required

Doctor of Philosophy in Management and Decision Sciences

The Ph.D. in Management and Decision Sciences program is designed to prepare accomplished professionals for senior positions in either public or private sectors. The mission of the Doctor of Philosophy in Management and Decision Science degree (Ph.D. MDS) is to enable professionals from the field to understand and evaluate the scope and impact of decision sciences and associated technology from the institutional as well as from an industry and global perspective. The program will provide the student an academic environment to support the development of high-level critical thinking and leadership skills as they relate to management and decision sciences, to develop high-level decision science technical skills, and to provide doctoral level research experience allowing innovative and practical contributions to the management and decision sciences body of knowledge.

Graduates of Capitol Technology University's Ph.D. program can expect to lead local, national, or global organizations in related fields and provide expert guidance for the understanding of and the utilization of organizational information assets. Graduates can expect to be hired into senior leadership positions in industry, government and academia, and will be able to create and manage unique solutions for any business decision challenge that may arise.

Course Sequence of Study

Doctor of Science **54 Credits**

Course	*Credits*
YEAR 1	
First Semester	
DSM-802 Fundamentals of Doctoral Learning (Sixteen week course)	6
Second Semester	
PHL-900 Management Theory in a Global Economy (Term One)	3
DSM-905 Organizational Change and Information Systems Implementation and Practice I (Term Two)	3
Third Semester	
DSM-910 Analytics and Decision Analysis (Term One)	3
RSC-811 Professional Research Theory and Practice (Term Two)	3
RSC-821 Contemporary Research in Management (Residency)	3
YEAR 2	
First Semester	
DSM-915 Applied Statistics and Visualization for Analytics (Term One)	3
DSM-920 Big Data Warehousing and Analytic Systems (Term Two)	3
Second Semester	
PHL-880 Special Topics in Management (Term One)	3
PHL-813 Professional Ethics and Leadership (Term Two)	3
Third Semester	
RSC-815 Problem-Solving and Decision-Making Using Quantitative Methods (Term One)	3
Graduate/Post-graduate Elective (Term Two)	3
DSR-930 Management and Security of Information (Residency)	3
YEAR 3 – First 16 weeks/Term One/Term Two	
First Semester	
DSR-900 Graduate/Post-Graduate Elective (Term One)	3
Graduate/Post-Graduate Elective (Term Two)	3
Second Semester	
DSR-945 Dissertation Preparation, Part II: Proposal (Term One)	3
DSR-960 Dissertation Presentation and Oral Defense (Residency Course, 3-day weekend)	3
Electives	12 Credits
DSM-925 Supply Chain Design and Analysis	3
DSM-935 Decision Support and Knowledge Based Systems	3
DSM-940 Web Analytics	3
DSM-945 Optimization Techniques for Management Decisions	3
DSM-950 Strategic Management	3

As new electives are added, this list will expand. Please consult the School of Business and Information Sciences to inquire about new elective offerings or to propose new ones.

For descriptions of required courses, see courses beginning on page 72.

Doctor of Science in Cybersecurity

The Doctor of Science in Cybersecurity degree program integrates content from academia, government, and industry into a challenging curriculum that adheres to high federal standards, prepares individuals for the rigors of federal agencies and industry, and results in graduates who are prepared to lead the field's top organizations.

Students take courses in small cohort groups comprised of government, industry, and military personnel. Upon graduation, doctoral students are able to conduct research as a foundation for executive action, demonstrate innovation and creativity as it relates to the strategic performance of an agency or organization, and apply a local, national, and global perspective to the decision-making process.

The program provides students an academic environment to support the development of high-level critical thinking and leadership skills, technical skills and research experience in order to provide significant contributions to the IA body of knowledge. The program maintains balance between a strong theoretical foundation, hands-on experience and innovative research. Graduates are well prepared to lead local, national or global organizations in IT-related fields and provide expert guidance for the protection of information assets.

Course Sequence of Study

Doctor of Science **54-66 Credits**

Course	*Credits*
YEAR 1	
First Semester	
RSC-802 Fundamentals of Doctoral Learning (Sixteen week course)	6
Second Semester	
IAE-830 IA Research Literature (Term One)	
RSC-810 Professional Research: Theory and Practice I (Term Two)	3
RSC-820 Situation Awareness Analysis and Action Plan Processes (Residency Course, 3-day weekend)	3
Third Semester	
RSC-825 Applied Research in IA (Term One)	
RSC-813 Professional Ethics and Leadership (Term Two)	3
YEAR 2	
First Semester	
IAE-860 Advanced Research Methods (Term One)	3
Elective (Term Two)	3
Second Semester	
RSC-812 Professional Research: Theory and Practice II (Term One)	3
IAE-880 Special Topics in IA (Term Two)	3
DSR-925 Dissertation Preparation (Residency Course, 3-day weekend)	3
Third Semester	
Electives (Term One)	
Electives (Term Two)	3
YEAR 3 – First 16 weeks/Term One/Term Two	
First Semester	
DSR-900 Writing the Doctoral Dissertation, Part I: Proposal/Comp Exam II (Term One)	3
Elective (Term Two)	3
Second Semester	
DSR-935 Dissertation Preparation, Part II: Proposal (Term One)	3
DSR-950 Dissertation Presentation and Oral Defense (Residency Course, 3-day weekend)	3
Electives	12 Credits
IAE-690 Healthcare Information Security	3
IAE-835 Information Assurance Strategic Management	3
IAE-837 Contemporary Issues in IA	3
IAE-845 Pedagogy and Information Assurance	3
IAE-871 Software Assurance Assessment	3
IAE-872 Software Assurance Development	3
IAE-873 Syllabus Software Assurance Management	3
IAE-874 Assured Software Analytics	3
IAE-880 Special Topics in IA	3
IAE-881 Special Topics in IA, Part II	3
IAE-882 Special Topics in IA, Part III	3
IAE-883 Special Topics in IA, Part IV	3
IAE-884 Special Topics in IA, Part V	3
RSC-815 Problem Solving and Decision Making with Quantitative Methods	3
DSR-940 Proposal Writing I (as needed)	3
DSR-941 Proposal Writing II (as needed)	3
DSR-942 Proposal Writing III (as needed)	3

As new electives are added, this list will expand. Please consult the IA department to inquire about new elective offerings or to propose new ones.

For descriptions of required courses, see courses beginning on page 72.

Master of Business Administration

The master of business administration (MBA) program is crafted to support professionals who are seeking credentials necessary to qualify for high level management and leadership positions, both in government and industry. MBA-core coursework and projects focus on strengthening your leadership skills, enhancing your understanding of new technologies, expanding your ability to use technology to solve business problems, and understanding the process of innovation. Specialization options include leadership, information assurance, information technology, or technology management law and policy. An additional specialization option emphasizing federal acquisition and DoD contracting is under development. Students complete the 36-39 credit hour program through a combination of accelerated 8-week terms and 16-week semesters.

Course Requirements

Master of Business Administration
36-39 Credits

Course	*Credits*
Core Courses	24-27 Credits
MBA-600 Fundamentals of Professional Mgmt	3*
MBA-615 Financial Management	3
MBA-620 Managerial Accounting	3
MBA-625 Organizational Behavior	3
MBA-630 Marketing Process and Strategy	3
MBA-635 Production and Operations Management	3
MBA-640 Managerial Economics	3
MBA-646 Project Management	3
MBA-650 Strategic Management	3
Capstone Course	3 Credits
MBA-700 Capstone Project	3
MBA-Electives	9 Credits

Complete a 9-credit specialization option, or with permission, choose any three graduate-level courses from the university inventory. Students may choose from the following options or choose master level electives from other Capitol Technology University degree programs. Prerequisites must be met.

Specialization options:

Leadership

The leadership specialization combines the best theories with proven strategies to help leaders manage change and achieve organizational objectives.

MBA-657 Transformational Leadership and Innovation	3
MBA-658 Legal, Political, and Ethical Implications for Leadership	3
MBA-659 Leadership and Managing Human Capital	3

Information Assurance

The IA specialization emphasizes information assurance challenges, to include general security issues, protection methodologies, and malicious software defense.

IAE-670 Network Systems Security Concepts	3
IAE-682 Internal Protection	3
IAE-677 Malicious Software	3

Information Technology

The information technology specialization provides a broad overview of IT management issues, to include the supporting role of info systems, telecommunications fundamentals, and the role of computers in management.

SM-563 Managing Information Systems	3
SM-567 Business Data Communications and Networking	3
SM-569 Decision Support and Expert Systems	3

Technology Management Law & Policy

This specialization focuses on regulatory compliance, to include transacting and marketing law, cyber security law, and the law that governs the legal use of intellectual property.

IAE-671 Legal Aspects of Computer Security and Information Privacy	3
IE-717 Invention, Innovation, and the Use of Intellectual Property	3
SM-587 Law and Regulation of E-Commerce	3

*MBA-600 is waived for students with a recent undergraduate degree (completed within the past 5 years) in business.

Courses are offered only online in 16-week or 8-week accelerated formats. For descriptions of required courses, see courses beginning on page 72.

Master of Science in Astronautical Engineering

The astronautical engineering (AE) degree is structured to focus on satellite and mission operations, and systems engineering. Coursework focuses on project management, remote sensing, systems engineering, satellite operations and mission planning.

AE majors study all phases of a satellite mission design, planning and operations, and systems engineering. Concepts relating to cybersecurity in Astronautical engineering are also stressed.

The master of science in astronautical engineering is a 30-credit degree program. All students complete two capstone classes involving research methods and, in consultation with faculty, develop a project-based research paper by integrating prior coursework and experiences. Students may choose to use two elective courses in conjunction with the capstone courses to specialize in one area of astronautics.

Course Requirements

Master of Science **30 Credits**

Course		*Credits*
Core Courses		18 Credits
AE-602	Spacecraft Mission Architecture and Management	3
AE-611	Space Systems Engineering	3
AE-652	Orbital Mechanics II	3
AE-654	Spacecraft Propulsion	3
AE-655	Spacecraft Sensors	3
IA-572	Software Assurance Development	3
Elective Courses		6 Credits
Choose any two below.		
AE-621	Satellite Ground Systems Operation	3
AE-662	Atomic and Molecular Spectroscopy	3
AE-701	Project Management	3
AE-712	Principles of Space Navigation	3
AE-711	Space Mission Analysis and Design	3
AE-720	Space Mission Design	3
EE-600	Mathematical Modeling and Analysis	3
IAE-571	Software Assurance Assessment	3
IAE-573	Software Assurance Management	3
IAE-574	Assured Software Analytics	3
Capstone Courses		6 Credits
AE-708	Master's Project Research	3
AE-758	Master's Project	3

Courses are offered only online in 16-week or 8-week accelerated formats. For descriptions of required courses, see courses beginning on page 72.

Master of Science in Computer Science

The computer science (CS) degree is structured to focus on new technologies, graphics aimed at virtual realities, and the Internet. The main objective of the program is to provide students with the advanced knowledge and skills necessary to design and use modern computer-based systems, with an emphasis on emerging technologies such as embedded languages, wireless technologies, miniaturization (PDAs), and data security.

CS majors study computer language design, intelligent systems design, and Multithreaded and distributed programming and may specialize in an area of their choice, including information architecture, network security or advanced computer science.

The master of science in computer science is a 30-credit degree program. All students complete a capstone course pair of Research Methods and the Capstone Research Project in which they identify a research topic in consultation with the faculty and develop a major project-based research paper by integrating prior coursework and personal experiences.

Course Requirements

Master of Science **30 Credits**

Course		*Credits*
Core Courses		12 Credits
CS-504	Theory of Computation	3
CS-512	Computer Language Design	3
CS-701	Designing Intelligent Systems	3
CS-705	Multithreaded and Distributed Programming	3
Elective Courses		12 Credits
Choose any four below.		
CS-507	Database Systems Implementation	3
CS-511	Numerical Methods	3
CS-513	Gaming Theory – Real-time 3D Graphics	3
IAE-670	Network Systems Security Concepts	3
IAE-673	Secure Information Transfer and Storage	3
IAE-677	Malicious Software	3
IAE-682	Internal Protection	3
IAE-684	Complimentary Security	3
IE-705	Comparison of Operating Systems and Web Servers	3
IE-707	Network Architecture Convergence Using Wireless Technology	3
IE-713	Multimedia and Web Casting	3
IE-719	Capstone Course	3
Capstone Courses		6 Credits
CS-712	Research Methods	3
CS-714	Capstone Research Project	3

Courses are offered only online in 16-week formats. For descriptions of required courses, see courses beginning on page 72.

Master of Science in Cyber and Information Security

The Master of Science in Cyber and Information Security (CIS) degree is structured to meet the needs of government and industry to understand, prepare for, respond to, and recover from threats to our information infrastructures. The main objective of the program is to provide information system and security professionals with in-depth instruction on new security ideas, concepts and techniques to prevent and react to malicious intrusion and to secure information assets. The National Security Agency and Department of Homeland Security have designated Capitol Technology University a National Center of Academic Excellence in Information Assurance Education. The Master of Science in Cyber and Information Security curriculum is mapped to all current federal domains at the most advanced level specified in the standards, and also covers the 10 domains of the CISSP (Certified Information Systems Security Professional), considered the gold-standard of industry certification. Some students may be required to take IAE-500 and CS-620; however, waivers may be granted in some cases with department chair or dean approval. CS-620 can be used as an elective or substituted with another course.

Course Requirements

Master of Science **36-39 Credits**

Course		*Credits*
Core Courses		24-27 Credits
IAE-500	Intro/Information Assurance*	3
CS-620	Operating System Principles for Information Assurance*	3
IAE-671	Legal Aspects of Computer Security and Information Privacy	3
IAE-673	Secure Information Transfer and Storage	3
IAE-677	Malicious Software	3
IAE-680	Perimeter Protection	3
IAE-682	Internal Protection	3
IAE-685	Principles of Cybersecurity	

*IAE-500 and CS 620 may be waived with department chair or dean approval. CS must be substituted.

Capstone Course

IAE-674 Security Risk Management (Should be taken after IAE-680)

Elective Courses 12 Credits

Choose any combination of four courses from the following list of electives or, with permission, choose any courses from graduate course inventory:

Information Assurance Electives

IAE-605	Master's Research	3
IAE 610	Advanced Penetration Testing	3
IAE-611	Mobile Computing Security	3
IAE-620	Mobile Device Forensics	
IAE-621	Applied Wireless Network Security	3
IAE-630	SCADA Networks and ICS Security	3
IAE-640	Access and Identity Management	3
IAE-670	Network Systems Security Concepts	3
IAE-672	Cryptography	3
IAE0673	Secure Information Transfer and Storage	3
IAE-679	Vulnerability Mitigation	3
IAE-686	Managing Information Security	3
IAE-684	Complementary Security	3
IAE-690	Healthcare Info System Security	3
IAE-692	Mobile Medical Device/Application Security	3
IAE-705	Master's Thesis	3

Network Engineering Electives

IE-701	Principles of Designing and Engineering Computer Networks	3
IE-707	Network Architecture Convergence Using Wireless Technology	3
IE-712	Design and Practice of Secure Information Networks	3
IE-730	SCADA Networks and Industrial Control Systems	3

Project Management Electives

MBA-501	Professional Writing Practicum
MBA-646	Project Management
MBA-647	Methods of Project Management
MBA-648	Project Management/Competitive Advantage

Software Assurance Electives

IAE-571	Software Assurance Assessment
IAE-572	Software Assurance Development
IAE-573	Software Assurance Management
IAE-574	Assured Software Analytics

Courses are offered only online in 16-week or 8-week accelerated formats. For descriptions of required courses, see courses beginning on page 72.

Master of Science in Electrical Engineering

The electrical engineering (EE) degree is structured to educate students to design and develop applications from the inception stage through the manufacturing, testing, and delivery of a product. The main objective of the program is to provide traditional engineers with the fundamentals of circuit modeling and design, circuit analysis, circuit construction and testing, government and industry regulations, and the advanced knowledge and skills necessary to design and use modern computer-based design and analysis software.

EE majors study mathematical modeling and analysis, electromagnetic interference and compatibility, and advanced concepts of design for reliability, manufacturability and testability with the emphasis of the program on the practical applications of theoretical principles to the design and construction of circuits to meet industrial, military and international standards.

The master of science in electrical engineering is a 30-credit degree program. All students complete a capstone course pair in which they choose a project in consultation with the faculty and carry the research of the project through proposal, design, testing and delivery. Students may choose to use the two elective courses in conjunction with the capstone courses to obtain a four-course certificate in an area of specialization.

The university has developed a bridge course, EE-500 Advanced Signal Processing, to allow students who do not meet the upper-level prerequisites an opportunity to qualify for acceptance. Credit for EE-500 is not awarded toward MSEE degree completion.

Course Requirements

Master of Science **30 Credits**

Course		*Credits*
Core Courses		18 Credits
EE-600	Mathematical Modeling and Analysis	3
EE-601	Modern Circuit Design and Simulation	3
EE-606	Signal Processing	3
EE-607	Electromagnetic Interference and Compatibility	3
EE-710	Designing for Reliability and Manufacturability	3
EE-720	Designing for Testability	3

Electives Courses 6 Credits

Choose any two courses below.

AE-611	Space Systems Engineering	3
EE-614	Large Scale Integrated Design	3
EE-651	Communications Theory	3
EE-652	Microcontroller System Development	3
EE-653	Analog and Digital Control Theory	3
EE-656	Image Processing	3
EE-665	Microwave Circuit Theory and Design	3
IAE-621	Applied Wireless Network Security	3
IE-701	Principles of Designing and Engineering Computer Networks	3
IE-707	Network Architecture Convergence Using Wireless Technology	3

Capstone Courses 6 Credits

EE-708	Master's Project Research	3
EE-758	Master's Project	3

Courses are offered only online in 16-week or 8-week accelerated formats. For descriptions of required courses, see courses beginning on page 72.

Master of Science in Information Systems Management

The mission of the Master of Science in Information Systems Management (MSISM) is to deliver a program of excellence in the study of systems management and business analytics. The program delivers a core set of advanced courses in both systems management and business analytics. Graduates are prepared to influence decision making, strategy, and operations with fact-based insight and an in-depth understanding of business performance analysis from a systems view. MSISM provides an integrated curriculum and a global perspective using evolving technology platforms to facilitate and support the learning process. This program is designed for students who want to enter or advance a career in business analytics. It is also designed for students who have an interest in quantitative methods, exploring and uncovering relationships through data analysis, and using the data to solve business problems. The MSISM is also ideal for MBA students seeking a quantitative second degree.

Course Requirements

Master of Science **36 Credits**

Course		*Credits*
Core Courses		27 Credits
MBA-646	Project Management	3
SM-525	Statistics for Managers	3
SM-570	Business Analytics	3
SM-513	Systems Management and Organization Theory	3
SM-517	Psychological Factors in Systems Management	3
SM-518	Principles of Systems	3
SM-563	Managing Information Systems	3
SM-567	Business Data Communications and Networking	3
SM-569	Decision Support and Expert Systems	3
Specialization Options		9 Credits

Complete a 9-credit specialization option, or with permission, choose any three graduate-level courses from the university inventory.

Leadership		
MBA-657	Transformational Leadership and Innovation	3
MBA-658	Legal. Political, and Ethical Implications for Leadership	3
MBA-659	Leadership and Managing Human Capital	3
Information Assurance		
IAE-670	Network Systems Security Concepts	3
IAE-677	Malicious Software	3
IAE-682	Internal Protection	3
Technology Management Law & Policy		
IAE-671	Legal Aspects of Computer Security	3
IE-717	Invention, Innovation, and the Use of Intellectual Property	3
SM-587	Law and Regulation of E-Commerce	3

Courses are offered only online in 16-week or 8-week accelerated formats. For descriptions of required courses, see courses beginning on page 72.

Master of Science in Internet Engineering

Technological advances are driving the convergence of separate voice, data, message switch and video networks onto a single, network-based platform using TCP/IP technology. To stay competitive, companies must if they want to integrate their existing network or rebuild from scratch. The master of science in Internet engineering degree (IE) prepares students to choose the best option.

The 30-credit graduate program is designed to fill the need for professionals who know how to build new networks or migrate existing ones onto platforms based primarily on TCP/IP technology. Network reliability, survivability and outage-recovery design techniques are also featured in the program, as is the practical use and integration of wireless networks.

Network security is taught and practiced throughout the degree program.

Graduates of this degree program are prepared for career opportunities as senior network administrators, engineers and consultants, chief technical officers and chief information officers.

Many of the courses use OPNET, recognized by network engineers and planners as the most advanced network modeling software in the world. Throughout the MSIE program, students will practice network convergence and migration techniques by accessing the OPNET lab applications remotely from personal computers. OPNET lab exercises also include network design techniques that increase the security, survivability and recoverability of networks.

Course Requirements

Master of Science **30 Credits**

Course		*Credits*
Core Courses		27 Credits
IE-701	Principles of Designing and Engineering Computer Networks	3
IE-703	Thin and Fat Client Deployment with Multitiered/Service-Oriented Architecture and Web 2.0	3
IE-705	Comparison of Operating Systems and Web Servers	3
IE-707	Network Architecture Convergence Using Wireless Technology	3
IE-709	Comparison of Object-Oriented and Scripting Languages	3
IE-712	Design of Cloud Networks and Services	3
IE-713	Multimedia and Web Casting	3
IE-715	Identifying and Integrating Component Collaboration Technologies	3
IE-717	Invention, Innovation, and the Use of Intellectual Property	3
Capstone Course		3 Credits
IE-719	Capstone Course*	3

* Students may substitute an elective according to their specific career goals.

Courses are offered only online in 16-week or 8-week accelerated formats. For descriptions of required courses, see courses beginning on page 72.

Post-baccalaureate Certificates

The post-baccalaureate certificates are targeted toward systems managers and information assurance professionals seeking to augment or update their skills and career with graduate-level credentials. Certificate students must complete the specific courses listed for the certificate; no substitutions are permitted. Once the course requirements are completed, students must apply for the certificate through the Office of Registration and Records. A $25 processing fee is due with the certificate request. A student must have a minimum cumulative GPA of 3.0 in all certificate coursework to be awarded the certificate.

The courses required for these certificates are offered only online in accelerated 8-week terms and 16-week semesters. Consult the schedule of classes for more information.

For descriptions of required courses, see courses beginning on page 72.

Acquisition Management
(12 credits)

This certificate is designed to provide students with knowledge of the broad concepts and strategies of procurement and contract management, which contributes to the ability to make sound business decisions. Major topics include the foundations of pricing and negotiations, basic aspects of contracting, procurement of services and products, software acquisitions, and mergers and acquisitions.

Required Courses

MBA-646	Project Management	3
MBA-701	Federal Acquisitions Management	3
MBA-702	Mergers and Acquisitions	3
MBA-703	Software Acquisitions	3

Client/Server and Wireless Devices
(12 credits)

This certificate provides students with a specialization in the hardware and software that drive local, Internet and wireless computing. Students learn the technical aspects of network and wireless devices and the standards and protocols of connectivity. An introductory course in network devices explores the technologies that link personal computers to servers and servers to servers. The three additional courses explore the movement from cable-connected terminals to remote server technology, the similarities and differences between operating systems and web servers, and the various wireless technologies and devices for personal and business communications.

Required Courses

IE-701	Principles of Designing and Engineering Computer Networks	3
IE-703	Thin and Fat Client Deployment with Multitiered/Service-Oriented Architecture and Web 2.0	3
IE-705	Comparison of Operating Systems and Web Servers	3
IE-707	Network Architecture Convergence Using Wireless Technology	3

Component Technologies and Online Collaboration
(12 credits)

This certificate provides students with an advanced understanding of the sophisticated technologies used to develop, integrate, and deploy e-business solutions. Students learn aspects of programming tools for online applications, technologies and policies of multimedia products, and component integration for on-demand communications. Courses in object-oriented and scripting languages and component collaboration technologies explore the development and optimization of electronic commerce applications. A multimedia and web casting course and a policy course in intellectual property explore the technical, marketing and legal aspect of online multimedia.

Required Courses

IE-709	Comparison of Object-Oriented and Scripting Languages	3
IE-713	Multimedia and Web Casting	3
IE-715	Identifying and Integrating Component Collaboration Technologies	3
IE-717	Invention, Innovation, and the Use of Intellectual Property	3

Digital Forensics and Incident Handling (12 credits)

This certificate prepares students to analyze computer systems and components such as hard drives, memory, networks and mobile devices. Students will also learn the art of the detecting Malware and effective incident handling to maintain the security of customer data. Students will also learn basic UNIX operating system commands and concepts, C programming as well as use state of the art Forensics tools.

Required Courses

IAE-620	Mobile Device Forensics	3
IAE-675	Computer Forensics and Incident Handling	3
IAE-677	Malicious Software	3
CS-620	Operating System Principles for Information Assurance	3

Information Assurance Administration (12 credits)

This certificate provides a thorough understanding of the general methodologies for security risk assessment and security test and evaluation, including the interviews and documentation research necessary. Incident handling and response is addressed, as well as intrusion detection and defense in depth. In addition, students learn how to reduce their risk of potential legal liability for computer security or information privacy failures. This certificate is restricted to MSIA degree seeking students or seasoned IA professionals.

Required Courses

IAE-671	Legal Aspects of Computer Security & Information Privacy	3
IAE-674	Security Risk Management	3
IAE-675	Computer Forensics and Incident Handling	3
AE-680	Perimeter Protection	3

Information Technology (12 credits)

This certificate provides students with a foundational knowledge of systems management with respect to telecommunications systems as well as the computer systems that support managerial decision-making. Students learn principles of technology management and information systems. Introductory courses in systems management and telecommunications networks provide the fundamental principles applied in the decision support and expert systems course. A course in strategic management of business technology lays the foundation for business management in a global environment with specific attention given to electronic commerce management goals.

Required Courses

MBA-650	Strategic Management	3
SM-563	Managing Information Systems	3
SM-567	Business Data Communications and Networking	3
SM-569	Decision Support and Expert Systems	3

Network Protection (12 credits)

This certificate provides a detailed understanding of methods computer hackers utilize to infiltrate web and application technologies, including wireless networks. Emphasis is placed on how security professionals can anticipate and protect against attacks through internal and external vulnerability assessment. Students learn the anatomies of viruses and worms and study a range of defense mechanisms applicable to the daily challenges faced by today's security professionals. In addition, students are trained to use the most popular hacking, cracking and wireless security network analysis tools in order to test and secure wireless networks.

Required Courses

IAE-621	Applied Wireless Network Security	3
IAE-677	Malicious Software	3
IAE-679	Vulnerability Mitigation	3
IAE-682	Internal Protection	3

Project Management
(12 credits)

The graduate certificate in Project Management is built on core processes defined in the Project Management Body of Knowledge (PMBOK). The certificate consists of four core courses, which provide students the opportunity to learn the basic concepts and strategies of project management required to successfully manage projects in both government and private industry.

Required Courses

MBA-646	Project Management	3
MBA-647	Methods of IT Project Management	3
MBA-648	Project Management Competitive Advantage	3
MBA-659	Leadership and Managing Human Capital	3

Secure Cloud Computing (12 credits)

This certificate prepares students to design, develop, operate and maintain the security of cloud architectures, customer data and the services offered to customers. Students will learn basic and advanced cyber defense strategies and techniques to secure customer systems and data and incident handling in case a breach is detected. Students will also learn basic UNIX operating system commands and concepts, C programming as well as use state of the art Forensics tools

Required Courses

IAE-680	Perimeter Protection	3
IE-712	Design of Cloud Networks and Services	3
CS-620	Operating Systems Principles for Information Assurance	3
CS-710	Bigdata Warehousing and Analytics Systems	3

Secure Mobile Technology (12 credits)

This certificate prepares students to design, develop, operate and maintain the security of mobile technologies, devices and services. Students will learn how to properly assess the security of and secure mobile devices as well as IEES 802.11 networks. Students will also be exposed to state of the art mobile forensics tools. Students will be prepared to address their organizations requirements for mobile device management.

Required Courses

IE-707	Network Architecture Convergence Using Wireless Technology	3
IAE-611	Mobile Computing Security	3
IAE-620	Mobile Device Forensics	3
IAE-621	Applied Wireless Network Security	3

Secure Software Development (12 credits)

This certificate prepares students to design, develop, operate and maintain secure software (i.e., software that performs only its intended functions without the presence of exploitable vulnerabilities). Topics covered by this certificate are programming, security design principles, and IT systems components and analytics. This course prepares students to deliver software that is both secure and efficient code.

Required Courses

IAE-571	Software Assurance Assessment	3
IAE-572	Software Assurance Development	3
IAE-573	Software Assurance Management	3
IAE-574	Assured Software Analytics	3

Security Management (12 credits)

This certificate provides students with a fundamental understanding of network systems security as it applies to the overall enterprise mission. Students learn aspects of detection, recovery and damage control methods as well as the laws and rights to privacy. An introductory course in network systems security concepts introduces students to the terminology, principles and special issues facing industries, including the importance of user involvement, security training, ethics, trust and informed management. The three additional courses focus on secure data transfer and storage with a history of cryptography and a study of public- and private-key algorithms, risk management with detailed instruction in contingency/disaster recovery planning research and security policy formulation and enforcement, and computer forensics and incident handling with a focus on legal and ethical issues of privacy associated with information and intellectual property and managing trouble tickets and analyzing events.

Required Courses

IAE-611	Mobile Computing Security	3
IAE-670	Network Systems Security Concepts	3
IAE-673	Secure Information Transfer and Storage	3
IAE-684	Managing Information Security	3

Non Credit Course and Certificate Offerings

Professional Development and Workforce Training

Capitol Technology University has a long history of supporting workforce development in industry and government. From technical training in areas such as Computer Forensics and SCADA protection to managerial areas such as project management and supply chain management, Capitol Technology University provides dedicated faculty who bring years of experience with theory and concepts. These customized programs are offered through our Critical Infrastructures and Cyber Protection Center (CICPC). Our programs can be delivered on customer site, on campus, and/or via our synchronous distance-learning platform. For more information about the center, see page 8.

Credit Bearing Courses

The numbers in parentheses indicate the following: for undergraduate, (in sequence) class hours – laboratory hours – semester credit hours; for graduate, the number of semester credit hours. Students must have completed the listed prerequisite or its equivalent before registering for a course.

Course Descriptions

AE-100 Introduction to Astronomy

Provides a general overview of topics in astronomy. Includes the history and evolution of our understanding of the solar system, stars, galaxies and cosmos. Basic processes that explain observations of phenomenon in our universe are discussed. May be used as a science elective. Corequisite: MA-114. Offered during Spring semester only. (3-0-3)

AE-150 Introduction to Space

Introduces the student to elements of astronomy and space sciences, the history of NASA and earth missions and operations and simple physics of satellite orbits, types of orbits and orbital terminology. Space environment and its effects on satellite and equipment. Discussion of satellites, types of satellites and their uses. Prerequisite: MA-114 or Corequisite: MA-261 Offered during Fall semester only. (3-0-3)

AE-200 High Vacuum Testing Techniques

This course covers the basic theory and practical knowledge to use, operate, manage or conduct tests in vacuum chambers. Terminology, equipment and methods of obtaining and maintaining vacuum environments, especially in regards to space simulation testing are covered. Topics will include types of vacuum pumps, system components, vacuum gauges, fittings, flanges, materials and their integration. Basic test procedures and standards. Offered Fall even years only. (3-0-3)

AE-205 CubeSat Engineering

End-to-end rapid development of a CubeSat-type satellite sensor system, power bus, and Arduino-based CPU. Students will form multi-disciplinary teams to collectively build, integrate and test a working design. Emphasis on design formalism, key trades, resource calculations, and integration of systems. Recipes and hardware components will be provided. Prerequisites: AE-150 or CS-130 or EL-100 (3-2-2)

AE-250 Ground Systems Engineering

Provides an introduction to the components that make up a satellite ground system. Included is the design and analysis of ground system components. Provides an introduction into satellite telemetry, command and control subsystems, as well as the software needed to build and run a ground system. Introduction to CCSDS standards and mission planning. Corequisite: CS-130 or equivalent. Prerequisite: AE-150. Offered spring semester only. (3-0-3)

AE-311 Spacecraft Systems

Design of spacecraft for different applications and missions. Passive and active devices. Designing with redundancy and reliability. Heating and cooling thermal issues. Power handling, telemetry and communications with antenna design. Propulsion, Thrusters and maneuvering. Command and control systems. Prerequisite: AE-150 or equivalent background Offered during Fall semester only.(3-0-3)

AE-350 Autonomous Ground Systems

Provides an in-depth introduction to the components that compose satellite ground systems in the commercial, military, and civil sectors from the inception of the space program to present day. Discusses conceptual and planned software development, integration and testing, launch operations, sustainment engineering, decommissioning of ground systems components and the system engineering processes involved in these activities. Introduces students to the tools and methods needed to create dynamic ground system components based on automation and autonomic principles. Cover CCSDS, ISO-900X, CMMI, UML, mission planning, flight dynamics principles and risk mitigation/anomaly resolution practices. Provides an introduction to STOL, CECIL, XML, and XTCE languages. Prerequisite: AE-150, AE-311, CS-130 (or equivalent), and EN-102 Offered Fall even years only.(3-0-3)

AE-351 Orbital Mechanics

Newton's equations and Keplers laws. Use of spherical coordinates to solve for orbital equations. Corrections to basic equations caused by earth's geometry, the moon and the sun. Other effects depending on orbital parameters. Prerequisite: MA-340 Offered during Fall semester only. (3-0-3)

AE-361 Introduction to Satellite Imaging

This is an introductory remote sensing and sensor course with a focus on methods, instruments and techniques used to obtain satellite imagery. Students will be introduced to physical principles of remote sensing, Earth and other planetary observing systems and sensors, and various digital processing techniques related to satellite sensing imagery. Topics include optics, solar radiation, principles of satellite imaging, image quality analysis, introduction to charged coupled devices (CCDs), and basics of sensor design. Prerequisite: PH-263 and AE-311 Offered Spring even years only. (3-0-3)

AE-400 Special Topics in Astronautical Engineering

Research into astronautical engineering subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. This course may be repeated with different projects. (1-4)

AE-401 Computational Dynamics

Advanced Orbital Mechanics: Effects of various gravitational variations of the earth, moon sun and other bodies on orbital equations. Perturbation and modeling of orbital equations. Use of numerical methods and commercial computer modeling to determine orbital paths. Prerequisites: MA-230 (or equivalent) and AE-351 Offered Spring even years only.(3-0-3)

AE-402 Special Topics in Astronautical Engineering II

Research into astronautical engineering subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. This course may be repeated with different projects. (3)

AE-410 Spacecraft Contamination

To understand the effective implementation of contamination control (CC) from component level to spacecraft level for mission success, including missions with planetary protection requirements. The importance of winning management and team support for the CC program will be emphasized.Definitions; nomenclature; symbols; units of measure; similarities and differences between aerospace, semiconductor and pharmaceutical cleanrooms. Discuss the ISO 14644 family of cleanroom standards. Missions lost or compromised by contamination from the early days to present Prerequisites: CH-120, PH-263, MA-340, AE-311 Offered Fall even years only.(3-0-3)

AE-411 Space Systems Engineering

Understand the basic principles and processes for designing effective systems, including how to determine customer needs vs wants, translate customer requirements into designs for systems that provide required performance and that are reliable, supportable and maintainable throughout the system life-cycle. Explore illustrative case studies. Team projects are assigned. Written reports and oral presentations are required. This is the undergraduate version of AE-611.Prerequisites: AE-311, AE-351 or permission of instructor. Offered(3-0-3)

AE-454 Spacecraft Dynamics and Control

Analysis of methods of monitoring maintaining and controlling spacecraft attitude and positioning. Propulsion systems. Effects of gravity gradients, space environment and atmospheric drag. Stabilization using controllers, actuators, sensors and impulse devices. Design of control subsystems. Systems engineering approach. Corequisite: EE-453 Offered Spring odd years only.(3-0-3).

AE-455 Satellite Communications

Analysis of satellite communications systems. Communications subsystems, telemetry, tracking and monitoring, data handling, satellite link design, propagation effects, modulation techniques and performance, error control. Satellite control networks SN, GN. TDRSS systems, positioning command and control. Prerequisites: AE-311 and MA-262 or equivalent. Offered Fall even years only.(2-2-3)

AE-458 Senior Project in Space Science

Continuation of EN-408 into project implementation phase of project. Students work on senior project and submit progress reports and design reviews. Presentation of final project with written and oral report required. Prerequisite: EN-408 (3-0-3)

AE-463 Space Systems Engineering Simulation and Modelling

This course focuses on software-based simulation relating to current era space and ground operations industry toolkits. The course has four components: basic concepts, use of the STK toolkit and other network simulation tools such as OPNET, evaluation of a COTS system, and student presentations and papers. The initial lectures will cover both the basics of per-component computational modeling as well as end-to-end concerns mission and information assurance requirements for real-world full scale systems.There will be additional focus on a risk based approach to securing such communications systems based on confidentially, integrity and availability of data.Students will then work with the Satellite Tool Kit (STK) (and other network simulation tools) to model a single discrete space asset or a multi-component ground communications system, including preparation for the STK Certification Exam. The student will then model their own scenario using mission modeling software. Finally, each student will present their specific scenario to the class, including critical analysis (report) of advantages and deficiencies in the tool of choice in terms of end-to-end systems engineering to include information and mission assurance concerns.

AE-513 Systems Management & Organization

Basic concepts applied to managing large-scale systems. Perspectives and philosophies of organization, functions and processes of systems management and organizational leadership. (3)

AE-518 Principles of Systems

Systems theories, methodologies, thinking and practice; hard and soft systems approaches; multidisciplinary approaches to organizational problem solving, feedback loops and system change. (3)

AE-571 Software Assurance Assessment

This course covers the fundamentals of establishing a required level of software and system assurance, applying methods and determining measures to assess whether the required level of assurance has been achieved. Topics include assessment methods; defining product measures, process measures and other performance indicators; measurement processes and frameworks; performance indicators for business survivability and continuity; and comparing selected measures to determine whether the software/system meets its required level of assurance. These fundamentals are applied to newly developed software and systems as well as during the acquisition of software and services. (3)

AE-572 Software Assurance Development

This course covers the fundamentals of incorporating assurance practices, methods, and technologies into software development and acquisition life-cycle processes and models. With this foundation, the course provides students with rigorous methods for eliciting software and system assurance requirements, using threat identification, characterization, and modeling; assurance risk assessment, and misuse/abuse cases. Students will also learn how to evaluate methods and environments for creating software and systems that meet their functionality and security requirements. (3)

AE-573 Software Assurance Management

This course covers the fundamentals of software and system assurance management, including making the business case for assurance; planning and managing development projects that include assurance practices; compliance with laws, regulations, standards and policies related to assurance; and risk assessment, identification, analysis, mitigation and monitoring for assurance. The focus is on how to manage business and technical requirements. (3)

AE-574 Assured Software Analytics

This course covers methods for assuring the security and functionality of existing software and services, whether legacy, internally developed, or externally acquired, with emphasis on detection of vulnerabilities and malicious content. It also discusses assurance considerations for system architectures, networks and databases in their role as underlying enablers of software operations. Methods for structuring and reverse engineering of existing software are covered, as are techniques for acquiring and assuring software and services through suppliers, service-oriented architectures and cloud computing environments. (3)

AE-602 Spacecraft Mission Architecture and Design

Provides an overview of all aspects of space mission design for practical approaches to reducing cost. Also, will examine the different programmatic/conceptual design/choice creation methods for space missions. Aerospace system engineering/architecture tools will be used to create innovative projects (3)

AE-611 Space Systems Engineering

Understand the basic principles and processes for designing effective systems, including how to determine customer needs vs wants, translate customer requirements into designs for systems that provide required performance and that are reliable, supportable and maintainable throughout the system life-cycle. Explore illustrative case studies. Team projects are assigned. Written reports and oral presentations are required. This is the graduate version of AE-411. (3)

AE-621 Satellite Ground Systems Operation

Provides an introduction to satellite control centers in both the NASA and NOAA environments. Examines the roles of flight operations, communications, mission planners, and other entities needed to perform successful satellite ground systems operations. (3)

AE-647 Methods of IT Project Management

Continuation of Orbital Mechanics I. Theory of perturbations of orbits; numerical methods in orbital mechanics; satellite dynamics; averaging methods; resonance; mission analysis.Pre-requisite: AE-351 (3)

AE-652 Orbital Mechanics II

Continuation of Orbital Mechanics I. Theory of perturbations of orbits; numerical methods in orbital mechanics; satellite dynamics; averaging methods; resonance; mission analysis.Pre-requisite: AE-351 (3)

AE-654 Space Propulsion

Introduction to rocket engineering, space missions and thrust requirements, liquid and solid-fueled rockets,nuclear and electric propulsion, propellant thermodynamics. Prerequisites: AE-351 or equivalent, AE311 or equivalent (3)

AE-655 Spacecraft Sensors

The operation, accuracy, resolution, and application of instruments which either produce images of ground scenes or probe the atmosphere as viewed primarily from space. Design of thermal and other satellite detectors and instrumentation as related to remote sensing applications. (3)

AE-661 Remote Sensing II

This course will build on the understanding and concepts of remote sensing introduced in the AE-361, Remote Sensing I, course. The course will emphasize the use of remote sensing data and image interpretation and processing techniques for environmental and urban applications.The main objective of this course is to provide students with the conceptual foundations and technical skills to work on remote sensing missions in the NASA and NOAA environments. Through laboratory projects students will be able to practice the concepts learned in lecture. Weekly discussion of peer reviewed journal articles or book chapters. (3)

AE-662 Atomic and Molecular Spectroscopy

The course will cover topics in Atomic and Molecular Spectroscopy applied to satellite-borne remote sensing instruments designed to study and monitor the earth system. The topics will include: Structure of one-electron and many electron atomic systems; Influence of external magnetic and electric fields on atomic systems; Spectra of molecules and the signatures for rotational and vibrational energy transitions; Atmospheric scattering processes including Rayleigh, Mie and Raman scattering; Spectroscopic instruments including spectrometers, detectors, and filters; Fourier spectroscopy; Optical properties of materials. (3)

AE-700 Research Topics in AE

Research into astronautical engineering subjects. Students primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. (3)

AE-701 Project Management

Provides an introduction of planning, scheduling, and controlling a system project during its life cycle. Focus on ethical, theoretical, and practical challenges of the project management framework, including the basic project management phases from initiation to closure and interactions. Projects will focus on the integration of project management and strategic management of satellite missions. (3)

AE-708 Master's Project Research

This course will cover all aspects of proposing and executing a research and development task. Pin response to Broad Agency Announcements. Creating Preliminary response, including quad charts and white papers. Techniques for providing a rough order of magnitude (ROM) cost. Preparing the full final proposal, including abstract, statement of work, schedule, milestones, deliverables, risk mitigation, preplanned follow-on efforts, procurement, subcontracts, describing the labor mix, and developing a full cost proposal. Attention will be given to protection of proprietary information, protection of intellectual property, and to compliance with Federal Acquisition Regulations (the FAR). The course will culminate with the execution of a mock project, with final deliverables, and final closeout of the project. Examples from Federal R&D projects in public domain will be used throughout the course. (3)

AE-710 Space Systems Design for Reliability

Design methodology and standards applied in the construction and assembly of electronic circuits for reliability. Redundancy, parallel structure and majority rule circuits. Materials and component selection. Vibrational analysis, thermal analysis and packaging. Classification of hardware for commercial, military or space applications. MIL-spec and IPC standards discussed. Normally offered during summer semester. (3)

AE-711 Space Mission Analysis and Design

Spacecraft mission design, space environment, attitude determination and control, telecommunications, propulsion, structures and mechanisms, thermal control, power systems, launch systems and facilities. System components; vehicle structure, propulsion systems, flight dynamics, thermal control, power systems, telecommunication. Interfaces and tradeoffs between these components. Testing, system reliability, and integration. Emphasis on studying NASA and NOAA past and current space mission. (3)

AE-712 Principles of Space Navigation

Statistical orbit determination: least squares, batch and Kalman (sequential) processing, online ephemeris generation, determination of potentially hazardous bodies/objects; launch vehicles, payloads, and staging. Prerequisites: AE-401 and EE-600 (3)

AE-720 Space Mission Design

Focus is on the development of human spacecraft from Vostok to the International Space Station. Spacecraft design requirements based on the space environment and human physiology will be discussed and a design process will be with taught using systems providing life support.

Students will study the designs of a spacecraft for a human interplanetary exploratory mission and will include technical design and program management. Course includes a student spacecraft system design project with presentation of proposals, design reviews and completed design projects. Prerequisite: AE-711 (3)

AE-758 Master's Project

Students integrate prior course work and personal experiences into a master's project. Students develop a full final proposal, including abstract, statement of work, schedule, milestones, deliverables as learned in EE-708. Proposal must be delivered to class and approval of project advisor required. Regular progress reports required. Final presentation will be live over the Internet. Prerequisite: AE-708. (3)

BUS-174 Introduction to Business and Management

This course presents a survey of the general business and management environment. Topics include an introduction to the various forms of business, organizational structure, and their legal implications. Modern management and supervision concepts, history and development of theory and practice, the roles of managers, and the relationship between manager and employee are examined. This is a seminar course with emphasis on class discussion and collaborative learning. Prerequisite or Corequisite EN-001 or EN-101. (3-0-3)

BUS-200 Business Communications

This course includes preparation for various kinds of both written and oral business communication. The course will develop and sharpen the critical thinking and writing skills, including report/proposal preparation and presentation needed in the workplace. Strategies for effective communication will also be explored. Prerequisite: EN-101. (3-0-3)

BUS-208 E-Commerce and the Law

This course examines legal concepts that arise out of conducting business through the Internet. This course examines a wide variety of concepts and issues that have a significant influence on the use of the Internet for business or personal gain. In addition to basic legal terms, topics such as how courts assert personal and subject matter jurisdiction, the use of long-arm statutes, the state and federal court systems, patents, copyrights, trademarks, trade secrets, and statutes that deal with hacking, on-line privacy and the protection of data are introduced. International jurisdiction issues will also be discussed. The class is structured as a seminar course with an emphasis on in-class discussion and collaborative learning. Prerequisite: EN-101. (3-0-3)

BUS-250 Database for Managers

A course that introduces the student to the basic concepts, organization, and implementation models of databases, with an emphasis on the relational model. Projects include hands-on work with entity-relationship and relational models. (3-0-3)

BUS-270 Financial Accounting I

This is an introductory accounting course that will provide students with a strong basic knowledge of accounting terms, concepts, and procedures. Analyzing business transactions as they relate to the General Ledger and the use of special journals will be addressed as well as the various processes and procedures related to the full accounting cycle. The accounting principles described are those endorsed by the Financial Accounting Standards Board. Corequisite: MA-110. (3-0-3)

BUS-271 Financial Accounting II

This course continues the focus on accounting principles, theories, and applications introduced in Financial Accounting I. It builds additional skills in ledger entry and organization, payroll accounting, and the development of financial statements. The foundation acquired in Accounting I is integral to exploring topics as accounting for partnerships and corporations, promissory notes, and valuation of assets. Prerequisite: BUS-270. (3-0-3)

BUS-275 Human Resource Management

Human Resource Management is a course with dual purposes. First, the development of employer-employee relations in both the private and public sector in order to facilitate organization productivity. Second, the management of scarce human resources in terms of planning and development techniques in both the private and public sector. Wage and salary administration, forecasting employment needs, recruiting and selection, evaluation, and training issues will be the focus of discussion and lecture. Prerequisites: EN-102 and BUS-279. (3-0-3)

BUS-279 Introduction to Leadership

This course overviews the disciplines and competencies associated with leadership in the 21st Century. In particular, the study and application of skills, theories, and concepts in a multicultural society will be examined. This is a seminar course with emphasis on class discussion and collaborative learning. Prerequisite: BUS-174 Corequisite EN-101. (3-0-3)

BUS-280 Macroeconomics

This course is an introduction to macroeconomic concepts and analysis. It deals with the relationship between government, business, and the overall economy. The key areas focused on include gross domestic product, the public sector, unemployment, and aggregate supply and demand. The global economy is covered with discussion of issues such as international trade and protectionism. Prerequisite: EN-101. (3-0-3)

BUS-281 Microeconomics

This course is an introduction to microeconomic concepts and analysis. The course focuses on competitive market dynamics including individual and firm behavior through the study of market structure and economic decisions regarding production, pricing, and personnel. Labor markets and labor unions are addressed as well as regulatory and distributional issues. Prerequisite: EN-101. (3-0-3)

BUS-283 Managerial Accounting

This course focuses on budgeting and planning. Emphasis is on the use of accounting information to plan and redirect allocations to support business decisions. Managerial Accounting is designed to follow Principles of Accounting. Prerequisite: BUS-270. (3-0-3)

BUS-289 Entrepreneurship and Small Business Management

This course provides an overview of the principles and processes of entrepreneurship and small business management. Students learn to identify characteristics of entrepreneurs; identify business innovations; conduct feasibility analyses; develop formal business plans; and finance, organize, and operate a small business. Prerequisite: EN-101 (3-0-3)

BUS-301 Project Management

This course is a full range introduction to project management. It covers the origins, philosophy, methodology, and involves actual applications and use of tools such as MS Project. The System Development Cycle is used as a framework to discuss project management in a variety of situations. Illustrative cases are used and project leadership and team building are covered as integral aspects of good project management. Prerequisite: BUS-174 and EN-101 or permission of department chair. (3-0-3)

BUS-302 Methods of IT Project Management

Methods of IT Project Management focuses on IT project management and is built around the Project Management Body of Knowledge (PMBOK). You will learn how IT projects differ from other kinds of projects and how the methods and techniques of project management must be modified/adapted for IT projects. In addition, students will gain an increased understanding of what managers do (or should be doing) and why managers ask you to do the things that they do. The course presents methods, tools, and techniques that can be used to effectively manage IT projects, both large and small. Prerequisite: BUS-301, Project Management, or equivalent (3-0-3)

BUS-303 Project Management Competitive Advantage

Project Management takes decision-making and a business-oriented approach to the management of projects, which is reinforced throughout the course with current examples of project management in action. Project management is central to operations within the context of a variety of successful organizations, whether publicly held, private, or not-for-profit. Prerequisite: BUS-301 or equivalent (3-0-3)

BUS-350 Decision Models with Spreadsheets

The main objective of this course is to teach how to solve modern business problems using a spreadsheet application. Popular spreadsheet applications are examined. Students will use the case study method to address analytical problems. Prerequisite: MA-128, BUS-301 and BUS-384. (3-0-3)

BUS-362 Information Systems for Managers

Computer-based information systems and online information systems to increase individual and organizational efficiency and productivity constitute the foundation of this course. Topics include information systems for database management, transaction processing, knowledge worker, office automation, management information, decision support, and executive support. The course also includes system security, troubleshooting, and disaster recovery, system upgrading, and client/server issues. Prerequisites: EN-102 and BUS-279. (3-0-3)

BUS-372 Financial Management

This course is designed to familiarize the student with the principles that guide a firm's financial resources management. The primary philosophy around which this course is organized is wealth maximization and the decision criterion used to achieve such a state. Topics such as capital management, fixed-asset investment, cost of capital, capital structure, long-term finance, mergers, leasing, and multinational finance are covered. In addition, accounting terminology and concepts relevant to financial analysis and decision making will be presented. Prerequisites: BUS-270, MA-111 or MA-114. (3-0-3)

BUS-376 Marketing Principles

The role of marketing and the strategies used by marketing managers to solve problems is the content of this course. Emphasis is placed on the relationship among consumers, business, and government is regard to product, promotion, pricing, and distribution strategies. Industry standards and ethical practice are focal points of

the course. Prerequisite: MA-128 and BUS-386. (3-0-3)

BUS-377 Special Topics in Marketing

This is an advanced course in selected issues in the theory and application of marketing. Actual topics and cases will be chosen by the instructor and may vary from term to term. Prerequisites: BUS-200, BUS-375, BUS-386 and BUS-378 or BUS-208. (3-0-3)

BUS-378 Legal Environment of Business

This course introduces the student to legal reasoning; ethical norms; the legal process and the American legal system; administrative law process and the role of business people in that process; the study of selected areas of public and private law, such as securities regulation, antitrust, labor, product liability, contracts, and consumer and environmental law; and international dimensions of the legal environment of law. The purpose of the course is to establish legal literacy and to develop an understanding of legal dynamics, particularly in the business world. Prerequisites: EN-102, BUS-279. (3-0-3)

BUS-379 Integrated Marketing Communications

This course examines the development of marketing strategies and creative campaigns utilizing multiple marketing disciplines (paid advertising, public relations and promotions) and media (print, broadcast, online and social). Emphasis is placed on the coordinated impact of these communication tools in reaching target audiences.

Prerequsite: BUS-376 (3-0-3)

BUS-384 Productions and Operations Management

This course stresses the decisions that managers make in increasing productivity in a world economy, productions and operations management examines the processes by which goods and services are produced. Strategies, techniques and problems in forecasting, statistical quality control, total quality management, inventory management, scheduling, maintenance and reliability, product, process, technology, location, layout, and purchasing are the core topics of this course. Prerequisites: MA-128 and BUS-386. (3-0-3)

BUS-385 Federal Acquisitions and Contracting

This course covers the fundamentals of Federal acquisitions and contracting and will provide a comprehensive understanding of the acquisition environment. Students will develop professional skills for making business decisions and advising other acquisition team members to successfully meet customers' needs. Participation in small group simulation exercises will prepare students to provide contracting support within the overarching business relationships of government and industry. Prerequisite: BUS- 301 and BUS-384 or equivalent. (3-0-3)

BUS-386 Organizational Theory and Behavior

The content of this course represents a synthesis of behavioral sciences providing a broad framework for management. Topics include organization goals, authority and leadership, motivation and morale, work groups and group dynamics, communications, planning and management by objectives, concepts of organizational development, organizational structure and processes, and organizational conflict and change. Prerequisites: BUS-279 and EN-102. (3-0-3)

BUS-387 Mergers and Acquisitions

This course surveys the drivers of success in mergers and acquisitions (M&A) and develops your skills in the design and evaluation of these transactions. The M&A transactions will cover the foundation for a wide range of mergers and acquisition fields including corporate development, investment banking, consulting, and advising senior management. Prerequisite: BUS- 301 and BUS-384 or equivalent. (3-0-3)

BUS-388 Software Acquisitions

This course covers the acquisition of open systems and commercial off-the-shelf (COTS) products an increasingly vital element of corporate and government software development. Properly managed software acquisition offers potential for significant time and cost savings over a system's lifetime. The transition from proprietary, custom-built systems to systems based on standards and commercial products is not easy, however. Managers and their staff must understand the risks and opportunities associated with this acquisition approach. Prerequisite: BUS- 301 and BUS-384 or equivalent. (3-0-3)

BUS-389 Logistics & Supply Chain Management

This course examines the efficient flow of materials, products and information within and among organizations. Logistics management examines a wide variety of activities that have a significant influence on customer service, including inventory control, transportation, warehousing, facility location analysis, packaging, materials handling, parts and service support and product returns. Supply chain management examines the integration of business processes across organizations, from material sources and suppliers through manufacturing and processing, to the final customer. Prerequisites: BUS-386 and MA-128. (3-0-3)

BUS-390 eMarketing

This class will prepare students for the dynamic and evolving field of Internet Marketing. Through classroom and hands-on activities, students will gain experience with e-marketing approaches including websites, search engine marketing, online advertising, email marketing, various forms of social media, and mobile commerce. The emphasis is on the practical application of e-marketing technologies, including promotional methods, web analytics tools, and customer relationship management (CRM) processes used for consumer, business, and institutional markets. Students will study both current and emerging online marketing methods, along with their benefits and limitations. The objective is for students to develop an understanding of Internet marketing both in terms of strategy and tactics. Prerequisite: BUS-174, BUS-376. (3-0-3)

BUS-391 eCommerce

This course examines the opportunities and challenges faced in an increasingly digital world. More and more product information and selling strategies are linked to the worldwide web. The course is for those students who wish to learn the principles and processes of electronic commerce. The course provides an overview of web promotional strategies, technology and infrastructure concerns, security, supply chain management, and back-office processes. Students will study topics such as: website development and promotion, online marketing and advertising, outsourcing or in-house development decisions, back office operations and information technology, and sourcing and cost analysis of key services and technologies. Prerequisite: BUS-376, BUS-384. (3-0-3)

BUS-392 Retail Management

This course examines retailing theory and research to understand the way retailing works. Methods, strategies, resources and techniques required for retail management are stressed. Both brick and mortar and online retailing are covered. Prerequisite:BUS-386. (3-0-3)

BUS-393 Consumer Analysis

This course examines the identification and evaluation of distinguishing customer characteristics so as to better segment them in the marketplace and target marketing efforts to them. Prerequisites: BUS-376, MA-128 and SS-171. (3-0-3)

BUS-400 Research Methods

Introduction to business research methods. Through the coursework students will learn elements of the research process including problem definition, literature review, hypothesis development, types of research design and data collection methods; sampling strategies; data analysis and interpretation; qualitative research approaches; ethical issues in research; and the reporting of research results. The course encourages students to step outside the classroom and engage in research projects based on the real life case studies. Prerequisites: MA-128 and EN-102. (3-0-3)

BUS-410 Strategic Management

This senior level course is designed to provide students with a general overview of systematic and continuous planning processes used by management to gain strategic and competitive advantage. The students are exposed to, and practice, the complex interrelationships between strategy, structure, culture, and management. Strategic and tactical strategies are explored using case studies, projects and discussions. Students develop and assess the role of management in strategy formulation, implementation and evaluation. Prerequisites: BUS-372, BUS-384,BUS-375 and BUS-378 or BUS-208. (3-0-3)

BUS-454 International Business

Drawing upon previous management and business courses, this course studies the nature and scope of international trade and investment, international institutions, the international monetary system and exchange markets, and the cultural factor affecting international business operations and their influence on the principal business functions. The effects of the revolution in electronic technologies on global business are also examined. Case study analysis and a variety of current media are used in this course. Prerequisites: BUS-372, BUS-376 and BUS-386. (3-0-3)

BUS-458 Senior Project

This is a BA/MIT capstone course designed to challenge students as they work individually or in small teams on a real-world business/industry problem requiring technical expertise and management acumen. Drawing upon the course in technical report writing, students are required to submit a major report outlining and analyzing the problem and proposing management solutions. Prerequisites: BUS-400, BUS-410 and EN-408. EN-408 should be taken immediately before this course. (3-0-3)

BUS-460 Special Topics in Business

Research into business subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. This course may be repeated with different projects. Prerequisite: EN-102. (3-0-3)

CH-120 Chemistry
Metric system and significant figures; stoichiometry; fundamental concepts of atomic structure and its relationship to the periodic table; electron configuration; bonds and electronegativity; gases; oxidation states and redox; solutions, acids and bases, changes of state, thermodynamics, chemical kinetics and equilibrium. (2-2-3)

CS-100 Introduction to Programming Logic
This course will introduce students to the various techniques used in programming logic. The purpose of this course is to build baseline skills in the building of logic for procedural and object oriented programming with minimal coding but with an in-depth approach to design.This course is an excellent choice for programming beginners that want to obtain a good foundation to program in various languages using various programming approaches. (3-0-3)

CS-130 Computer Science Fundamentals I

Introduces students to the discipline, methodologies, and techniques of software development. The emphasis is on developing essential programming skills, an understanding of object-oriented design and good software engineering practices using the Java programming language. Program constructs include selection, looping, arrays, graphical output of data, the use of the standard Java class library, and construction of simple user-defined classes. Programming projects are assigned as part of the homework requirements. Prerequisite: MA-112. (3-2-4)

CS-150 Introduction to Programming Using C
This introductory course in programming will enable students to understand how computers translate basic human instructions into machine executable applications. The language of choice for this course is C. The C syntax that will be covered includes functions; variables and memory allocations including pointer notation; conditional statements and looping. Students will also learn binary to hexadecimal and decimal conversions along with basic computer architecture. Memory management, data input output and file manipulations will be among some other topics discussed and applied during this course. (3-2-4)

CS-200 Intro to Object-Oriented Programming in C++
Students learn how to program in C++ using an object oriented approach. Design of classes and objects. Inheritance and polymorphism: Use of pointers and data structured based projects. Prerequisite CS-130 or CS-150. (2-2-3)

CS-220 Database Management

An overview of database systems, with an emphasis on relational databases. Terminology, basic analysis and design using Entity-Relationship diagrams and relational schemas. Database implementation, queries and updates using SQL. Client/server and middleware. An overview of database administration, transactions and concurrency. Data warehouses. Projects, which are assigned as homework, are implemented in Oracle. Prerequisite: A grade of C or better in CS-130 or CT-115. You may take this course and CS-130 concurrently. (3-0-3)

CS-225 Intermediate Java Programming

This course provides a deeper look into the Java language with a special emphasis on object oriented design. Topics include multidimensional arrays, inheritance, interfaces, polymorphism, graphical user interfaces, exception handling, I/O, multithreading and Java Database Connectivity (JDBC). Programming projects are assigned as homework. Prerequisite: CS-130 Corequisite: CS-220. Offered spring semester only. (3-0-3)

CS-230 Computer Science Fundamentals II

Advance pointers and dynamic memory usage. Concepts of object-oriented design and programming. Includes classes, friend functions, templates, operator overloading, polymorphism, inheritance, exception handling, containers, iterators and the standard template library. Applications involve the use of simple data structures such as stacks, queues, linked lists and binary trees. Recursion, searching and sorting algorithms. The above concepts are implemented through a series of hands-on programming projects, all of which are completed as part of the homework requirements. Prerequisite: CS-130. (3-0-3)

CS-250 Introduction to Network Programming Using C

An introductory network programming course using the C programming language. Students will be provided an overview of the principles of computer networks with a detailed look at the OSI reference model and the TCP/IP stack. The emphasis is on understanding UNIX interprocess communication and developing network programs using connectionless and connection-oriented sockets. Extensive programming assignments will include the development of client/server and peer-to-peer network applications. Prerequisites: CS-150. (2-2-3)

CS-305 Android Application Development

Writing applications for mobile devices using the Android operating system. Installing and using the Android SDK. Creating GUI layouts, menus and dialog boxes. Graphics and event handling. Interfacing with built-in GPS, accelerometer, audio and video. User and file input and output. Web interfaces and sockets. Writing native applications. Debugging native applications from a host. Preparing an application for publication. High-level programming will be performed using Java and XML. Native programming will be performed in C/C++. Programming in ARM-7 assembly language will be introduced. Prerequisites: CT-150 or CS230. Some Unix/Linux experience is recommended. (3-0-3)

CS-310 Computer Algorithms

Mathematical fundamentals of algorithms and algorithmic techniques. Running Time Analysis of an algorithm. Searching, Sorting, and other techniques associated with retrieving information. Advanced Data structures such as Binary Search Trees and Heaps. Graph algorithms. Dynamic Programming (Knapsack, Floyd, DNA Algorithms, ..). Greedy algorithms (Coins, Scheduling, Huffman encoding, ..) . Course requires written programming assignments. Prerequisite: CS-230. Offered fall semester only. (3-0-3)

CS-316 Intelligent Systems

Fundamental techniques and concepts of intelligent systems: tree searching techniques including recursive searches, minmax algorithms, heuristics, alpha beta pruning. Lisp and Prolog programming languages. Genetic and a priori algorithms. Homework and programming assignments. Prerequisites: CS-230. Offered spring semester only. (3-0-3)

CS-320 Database Administration

This course covers the tasks performed by a database administrator. Topics include database architecture, capacity and performance requirements, database creation, user management, transaction management, backup and recovery, security, performance tuning and other administrative functions. Students will work with an Oracle database server. Prerequisite: CS-220 (3-0-3)

CS-330 iPhone App Development

Introduction to objective C, the programming language used for iphone app development. Overview of the xcode development environment, including debugging tools, versioning tools, object library, object attributes tools. Object oriented programming using Objective C. Model-View-Controller architecture in xcode. Graphical User Interface library and components. File system on the iphone; SqlLite and the iphone. Students learn how to make a complete iphone app with significant functionality and industry-standard user interface from scratch. Security issues with iphone software development.Prerequisites: CS-150, CS-230 (3-0-3)

CS-340 Game Programming Using 3D Graphics

Students learn how to build a game using the Unity game engine. Students learn how to use 2D and 3D graphics, sound files, and user driven programming to build a game using a game engine and a physics engine. Students learn how to use the Unity development environment, design a user interface, make scenes, retain persistent data, create and manage animation, collision detection, level management, use of game characters. Students learn how to create and code an end-to-end design of a playable game. Prerequisite: CS-230 and (CS-225 or CS-305 or CS-330. (3-0-3)

CS-351 Assembly Language Programming

This course introduces the student to assembly language, specifically which is used with the Intel 80x86 computer architecture. Topics include data representation, branching and looping, procedures, string operation, bit manipulation and macros. Secure coding techniques will be taught by exploring integer overflow and buffer overflow attacks. By learning how to write in assembly language, the student will better understand how programs are executed in a computer and how to optimize performance of programs written in high-level languages, such as C++. The student will be assigned programming projects as homework. Prerequisite: CS-130 or CS-150 (3-0-3)

CS-356 Dynamic Web Page Development

This course teaches the student how to generate dynamic web pages using data from a database. The course begins with an overview of the C# programming language and object-orientation. Using ASP.NET, this course explores the processing of web forms and controls, state management, validation and error handling, SQL database access and secure web site coding. Programming projects, including a group project, are assigned as part of the homework requirements. Perquisites: CS-220 or understanding of SQL. (3-0-3)

CS-400 Special Topics in CS

Applications of computer science principles or research into computer science subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. This course may be repeated with different projects. (1-4)

CS-405 Introduction to Software Design with UML

Undergraduate version of CS-505. Object Oriented principals and concepts, classes, objects and interfaces; as well as inheritance, encapsulation, polymorphism and aggregation; Students will explore the Unified Process and Object Oriented software life cycle. CASE tools and iterative and incremental software development approaches are also covered. Advantages of Object Oriented design patterns are demonstrated. Prerequisite: CS-225 or CS-230. (3-0-3)

CS-407 Database Systems Implementation

This is an undergraduate version of the graduate database course CS-507. Emphasis on DBMS

architecture and implementation issues such as storage structures, multidimensional index structures, query optimization, concurrency control and recovery, distributed processing, database security, and parallel database systems. Prerequisite: CS-220 or equivalent. (3-0-3)

CS-418 Operating Systems

Principles underlying computer operating systems are presented from a computer designer's perspective. Concepts explained include process concurrency, synchronization, resource management, input/output scheduling, job and process scheduling, scheduling policies, deadlock, semaphore, consumer/producer relationship, storage management (real storage management policies in a multiprogramming environment), virtual memory management (segmentation and paging), secure memory management, access control lists and kernal protection. An overview of contemporary operating systems with these principles. Students program in a high-level language. Projects are assigned as part of the homework requirements. Prerequisites: CS-150 and senior status. Offered fall semester only. (3-0-3)

CS-430 Game Programming on iPhone Platform

Students learn how to develop a game on the iPhone/iPad portable. Students learn the xcode development environment and use the Model-View-Controller architecture. Students will learn animation of objects, control of characters, collision avoidance and tracking the state of a game. Real world projects will be assigned as part of requirements. Prerequisite: CS-330. (3-0-3)

CS-431 Graphics and Game Design

Students learn how to develop and build a game using an industry-standard game engine such as Unity or Unreal. Students learn how to use 2D and 3D graphics, sound files, and user driven programming to build a 3D game. Students learn how to design and build a scene, manage game characters, manage game levels, manage and store game data. Prerequisite: CS-230. (2-2-3)

CS-432 Computer Graphics

Discussion of some basic types of computer graphic devices. Graphics and text modes, point plotting and line drawing, area filling image array plotting, mathematics and generation off two and three-dimensional translations. Rotations, scaling, reflections, orthogonal and perspective transformations. Projects are assigned as part of the homework requirements. Prerequisite: MA-330 and either CS-230 or CS-225. Offered on demand. (3-0-3)

CS-504 Theory of Computation

An investigation into the fundamental ideas and models underlying computing. Automata languages, determinism, Chompsky hierarchy, computability, Turing machines, Church's Thesis, complexity, NP-completeness, intractability. (Offered as a full semester course.) (3)

CS-505 Software Design with UML

Object Oriented principles and concepts, such as classes, objects and interfaces; as well as inheritance, encapsulation, polymorphism and aggregation; etc. Students will explore the Unified Process and Object Oriented software life cycle. CASE tools and iterative and incremental software development approaches are also covered. Advantages of Object Oriented design patterns are demonstrated. (3)

CS-507 Database Systems Implementation

E Emphasis on DBMS architecture and implementation issues such as storage structures, multidimensional index structures, query optimization, concurrency control and recovery, distributed processing, database security, and parallel database systems. (3)

CS-511 Numerical Methods

Analysis of errors in numerical computations, solution of linear algebraic systems of equations, matrix inversion, eigenvalues, roots of nonlinear equations, interpolation and approximation. (3)

CS-512 Computer Language Design

Using parsers and code generation techniques to fashion new mini-languages that can be used to creatively modify the interface between a user and the computer. Topics include language design; grammars; regular expression grammers; parsers and parser construction; parsing expressions; tokenizing; assemblers; engines vs. interpreters; logic, query and imperative language parsers and assemblers. (3)

CS-513 Gaming Theory-Real-Time 3D Graphics

The growing importance of virtual realities in training, scientific modeling, and communication comes on the heels of increasing processor capabilities, new innovations in hardware, increasingly sophisticated programming languages, and advanced math-based modeling techniques. Real-time 3D graphics are at the leading edge of these developments. Topics include mathematical foundations and modeling techniques, mapping, anti-aliasing, real-time rendering, Binary Space Partition Trees, object control issues. Uses C++ and the OpenGL graphics interface. (Offered as a full semester course.) (3)

CS-620 Operating System Principles for IA

This course is an overview of the UNIX operating system. The content will include shell programming, process management, processor management, storage management, scheduling algorithms, resource protection and system programming. The course will include programming projects focused on Information Assurance problem solving utilizing the C programming language primarily. Students are expected to be familiar with virtual machines, the UNIX command line and a basic programming language. Basic knowledge of C programming and UNIX helpful. (3)

CS-701 Designing Intelligent Systems

The artificial intelligence revival of the late 1980s has produced many new and innovative approaches to the creation of intelligent systems. Such systems permeate today's computer environment supporting everything from computer games to autonomous robotic systems and intelligent agents. The focus of this course will vary over time. Topics include knowledge representation and rule-based systems, fuzzy-logic systems, learning systems such as artificial neural networks and genetic algorithms, genetic programming and evolutionary computing, hybrid intelligent systems, and intelligent agents. (3)

CS-705 Multi-threaded and Distributed Program

Modern applications such as GUI interfaces use multithreaded programming to achieve responsiveness and to make efficient use of computer resources. In addition, the Internet has made distributed programming an integral part of almost every computing system. In today's world programmers and computer professionals must understand the principles underlying both these paradigms. Topics include concepts and applications of multithreaded and distributed programs. Process interaction using shared variables and message passing; systematic development of correct programs; general problem solving techniques; scientific computing; distributed systems. (3)

CS-710 Big Data Warehousing and Analytic Systems

This advanced course will equip the student with the necessary skills to solve complex problems and design solutions using Big Data. The student will be able to gain an understanding of how to design databases to manage large volumes of data, and how that data can be analyzed and translated into meaningful results. The student will be introduced to the field of Analytics, gain an understanding of Enterprise Data Warehousing models, be introduced to Data Mining techniques and tools used for mining the data warehouse, and build specific Data Marts. The student will be introduced to predictive analysis, and will be expected to develop models to extract data, perform trend analysis, establish patterns, and make projections. Prerequisites: Ability to use Structured Query Language with a basic relational database system; ability to read pseudocode, and understand basic data structures like arrays; and, an understanding of algebra and basic probability and statistics would be helpful, though not required. (3)

CS-712 Research Methods

This is part one of a two course sequence in research and writing. In part one, students work to identify a research topic and, as initial research begins, they investigate the requirements for maintaining a research journal, writing a research paper, and presenting a research paper. Students may petition for job-related substitute course.(3)

CS-714 Capstone Research Project

This is part two of a two course sequence in research and writing. The course is in graduate seminar format. Students integrate prior course work and personal experiences into researching an approved topic to produce a project-based paper. (Offered as a full semester course.) Students may petition for job-related substitute course. (3)

CSH-410 Honors Seminar in Neural Networks

Basics of neural network computing, important neural network models such as Adaline, Perceptron, back propagation, self-organizing maps, Hopfield nets. Analysis and limitations of neural networks; programming neural networks using OOP. Prerequisites: MA-261. CS-130 or CS-225 with grade of B or better; Junior or Senior status; Good programming skills, knowledge of matrices and some calculus. (3-0-3)

CSP-101 Introduction to Engineering Methods I

Students are introduced to MATLAB. Using MATLAB to do calculations, solving systems of equations. Using data for data analysis statistics, graphing with applications in engineering. Special focus on trig and advanced trig functions, precalculus. Prerequisite placement exam. (2-2-3)

CSP-102 Introduction to Engineering Methods II

Students are introduced to MATLAB. Using MATLAB to do calculations, solving systems of equations. Using data for data analysis statistics, graphing with applications in engineering. Introduction to C++, classes and objects, CGI programming, Graphics and GUI's. Prerequisite placement exam. (2-2-3)

CT-102 Introduction to Internet Applications

Introduces students to dynamic HTML Web pages, designed using tables,style sheets, cascading style sheets (CSS), images, and dynamic images, with emphasis on page layout, navigation bars and forms. Scripting languages are used to enhance Web page features. Graphic, video and

audio file standards, such as GIF, TIF, JPEG, WAV and MIDI are discussed. SGML and XML are defined, and role of XML in enabling the communication of data between disparate applications is discussed. Students are required to complete assignments as part of the homework requirements. (3-0-3)

CT-152 Introduction to UNIX

Unix file and operating system. Understanding multi-user and multitasking concepts. Editors, X-windows, Awk, email, Internet commands, shell commands and shell scripts. Projects, which provide practical experience, are completed as part of the homework requirements. (3-0-3)

CT-201 Multimedia Applications

Use online and resident window tools to create, edit and enhance text, audio, and video for multimedia applications, including multimedia Web pages and presentations. Study the philosophy, aesthetics and theory behind the layout, construction and display of multimedia material. Flash projects that include drawing, painting tools, color animation, buttons and actionscript are completed as part of the homework requirements. Prerequisite: CT-102 or equivalent. (3-0-3)

CT-206 Scripting Languages

Introduces students to the use of scripting and the scripting languages of Perl, Python, and Ruby on Rails. The class will cover the use of scripting to solve short problems, automate routine tasks, integrate across pieces of software, and prototype code ideas. The merits of code-complete design versus on-the-fly coding as well as coding and code documentation styles will be discussed. Tasks involving input/out, regular expressions, and file operations are included. Students are expected to fully script solutions for real-world tasks assigned as part of the course. Prerequisites: CS-130 or permission of instructor. (3-0-3)

CT-240 Internetworking with Routers/Switches

Configuring routers and switches to build multiprotocol internetworks. OSI reference model, basic LAN and WAN design, dial access services, TCP/IP protocol suites, IP addressing, subnetting, static and dynamic routing, WAN technologies such as HDLC, PPP, Frame Relay, ATM and ISDN. Prerequisites: NT-150 or professor approval. (2-2-3)

CT-376 Javascript

This course introduces the student to client-side web programming. Students learn javascript. Topics include programming fundamentals using javascript, functions, event handlers, how to create and use javascript libraries. Labs include how to use the prototype and scriptaculous libraries for visual effects. Use of google maps from a programmer's perspective. Debugging of javascript code. Other topics include CSS style sheets, XML,. JSON and AJAX. Programming projects are assigned as part of the homework requirements. Prerequisites: CS-130. (2-2-3)

CT-406 Web Programming Languages

This course will explore how to make a dynamic website using five programming languages: Perl, PHP, Java Servlets, Java Server Pages and C#. Students will have access to a Unix server including an Apache Web Server and a MySql Database. This course can be taken as an elective or as a substitute for CS-325 for degrees where CS-325 is a requirement (CS-325 is no longer offered). Prerequisites: CS-130 and CS-220. Formerly CT-366. (3-0-3)

CT-451 Special Topics

Students research current trends in telecommunications and emerging technologies. Oral presentation required. Prerequisite: Senior status. (3-0-3)

DSM-802 Fundamentals of Doctoral Learning

Students of doctoral level programs are taught the ability to create knowledge through original research in their areas of specialization. This course will orient new doctoral students to learning, researching, and writing, and prepare them for the entire program of study. Students will be introduced to critical thinking skills necessary for doctoral research. Students will be introduced to the standards of ethical research. Students work individually with the dissertation mentor to complete the dissertation proposal and prepare for the competency examination.(3)

DSM-905 Organizational Change & Information Systems

Information systems represent a critical resource to organizations; yet, there are many unknowns about how to successfully design and implement those systems and many firms today continue to struggle with the deployment process. This seminar explores issues associated with the implementation of information systems in organizations – including requirements analysis, project management, outsourcing, and virtual teams – using a variety of theoretical or conceptual lenses such as control and coordination, organizational change, and trust. The emphasis of this course is on understanding Information Systems implementation from an organizational perspective.(3)

DSM-910 Analytics and Decision Analytics

Course focus is predominantly on prescriptive analytics with some parts focused on predictive analytics. Topics include operations research techniques and their application to decision making such as mathematical optimization, networks modeling, stochastic modeling, and multi-objective modeling. Other topics such as PERT, CPM, computer simulation, decision analysis using decision trees and quantitative value functions, and heuristic methods are covered, as well as use of contemporary computer software for problem solving. In particular, the course will extensively use MS Excel for solving the decision-making problems. Case-study approach to problem solving is used. Prerequisite: DSM-802 (3)

DSM-915 Applied Statistics for Analysis

Introduces multivariate regression and random forests for modeling data. Addresses data access, variable selection and model diagnostics. Introduces foundations for visual thinking. Reviews common statistical graphics such as dot plots, box plots, q-q plots. Addresses more advanced methods such as scatterplot matrices enhanced by smoothed or density contours, and search tools for finding graphics with suggestive patterns. Course will introduce R software for analysis. A final project will involve visualization of a real data set. Prerequisite: Undergraduate statistics. (3)

DSM-920 Big Data Warehousing and Analytic Systems

This course will equip the student with the necessary skills to solve complex problems and design solutions using Big Data. The student will be able to gain an understanding of how to design databases to manage large volumes of data from multiple sources, and how that data can be analyzed and translated into meaningful results. The student will be introduced to the field of Analytics, gain an understanding of Enterprise Data Warehousing models, be introduced to Data Mining techniques and tools used for mining the data warehouse, and build specific Data Marts. The student will be introduced to predictive analysis, and will be expected to develop models to extract data, perform trend analysis, establish patterns, and make projections. Prerequisites: Ability to use Structured Query Language with a basic relational database system; ability to read pseudo code, and understand basic data structures like arrays; and, an understanding of algebra and basic probability and statistics would be helpful, though not required. Prerequisite: DSM-915

DSR-900 Writing the Doctoral Dissertation

Students work individually with the dissertation mentor to complete the dissertation proposal and prepare for the competency examination. Prerequisite: DSR-925. (3)

DSR-920 Dissertation Workgroup

This dissertation workgroup course is set up for Blackboard access. It is on a no credit, no grade and no charge basis. (3)

DSR-920 Dissertation Workgroup

This dissertation workgroup course is set up for Blackboard access. It is on a no credit, no grade and no charge basis. (3)

DSR-925 Dissertation Preparation I

(Residency) Students will generate significant portions of the dissertation proposal and receive faculty feedback on completed sections. (3)

DSR-930 Management and Security Information

The goal of this course is to provide an overview of the multi-faceted, global, and interdisciplinary field of security management. It takes a view from the top and presents future managers need to know about information security. The material covered addresses the managerial aspects of information security for future managers. Examples of information security issues and practices implemented in today's business environment are presented and skills reinforced as they are learned through hands-on activities and a real world case project. The course features numerous examples and case studies specific to security management, identifies specific security applications and examines the issues encountered within those areas. Prerequisite: DSM-920; RSC-815 (3) RESIDENCY

Students will also have the opportunity to receive guidance from faculty mentors in both the group and one-on-one environment in the development of the dissertation proposal.

DSR-935 Dissertation Preparation II

Students complete the dissertation milestones developed by the student and the mentor. Students who are not prepared to defend after completing DSR-935 must enroll in DSR-940. Prerequisite: DSR-900. (3)

DSR-940 Proposal Writing I

This course focuses on completion of chapters one and two.(3)

DSR-941 Proposal Writing II

This course focuses on completion of chapters two and three. (3)

DSR-942 Proposal Writing III

This course focuses on submission of proposal to IRB and ARB. (3)

DSR-945 Dissertation Presentation

Learners complete the dissertation milestones developed by the learner and the mentor. This includes an examination of all 5 of the dissertation chapters. Students who are not prepared to defend upon completion of this course must enroll in a course in the DSR-970 series prior to enrolling in DSR-960.(3)

DSR-950 Dissertation Presentation and Oral Defense
Learners prepare the dissertation for publication. Learner research is examined through an oral defense. Prerequisite: DSR-935. (3)

DSR-951 Dissertation Research I
This course is a continuation of research in preparation for the submission of a doctoral dissertation proposal. (3)

DSR-960 Dissertation Preparation and Oral Defemse
Learners prepare the dissertation for publication. Learner research is examined through an oral defense. (3)

EE-159 Circuit Theory
Network analysis, mesh analysis, nodal analysis, Thevenin, Norton, superposition, reciprocity, capacitors, inductors, RC circuits, RL circuits, RLC circuits. Steady state and transient conditions involving RC time constants, RL time constants. AC circuit analysis involving sine waves, phasors, reactance, impedance in series circuits, parallel circuits, and series-parallel circuits. Thevenin, Norton, network theorems. Power, effective power, resonance and filter circuits. Prerequisite: MA-114. Students who have taken EL-100 and EL-150 may not take this course for credit. (3-2-4)

EE-300 Power Supply and Regulator Design
Design and analysis of power supplies and regulators. Includes special adjustable and fixed voltage regulator ICs, three-pin regulators, switch-mode supplies. DC to DC convertors. Supply topologies, power handling, current limiting methods. Prerequisites: EL-250 and MA-261. (2-2-3)

EE-304 Digital Design I
Minimization of Boolean functions using Kamaugh Maps and Quine-McCluskey Tabulation. Multilevel circuits: PLAs, PALs, gate arrays. Combinational logic design with MSI LSI. Chip count reduction. Sequential circuit analysis and design. State tables and state diagrams. Asynchronous circuit design. Introduction to PAL design software. Students design, simulate and build circuits. Design using programmable devices. Prerequisite: EL-204. (2-2-3)

EE-309 Circuit Design and Simulation
An advanced circuit analysis course that introduces students to computer-aided electronics packages and automated design. Students design and analyze circuits both mathematically and with computer simulation. Students build the circuits and compare predicted results with measured results obtained in the laboratory. Prerequisites: MA-261 and EL-250 or equivalent. (2-2-3)

EE-353 Power System Engineering
Fundamentals of power transmission and electric motors. Single versus three-phase, poly-phase systems, synchronous, asynchronous machines. DC and compound DC motors, induction motors. Equivalent circuit modeling of motors. Start-up conditions. Transformers, Transmission of Electrical Energy, Energy Distribution and Harmonics. Prerequisites: EE-159 and MA-261. (3-0-3)

EE-354 Digital Design II
Continuation of Digital Design I. Students explore larger-scale digital arithmetic and logic development using VHDL and a current FPGA development board. Students design and build circuits according to design objectives in two parts: students design, compile and verify their circuits using timing simulation on computers; then build and test circuits for upload to an FPGA. Final project involves design, assembly and testing of a VHDL-based system. Prerequisite: EE-304. Offered during spring semester only. (2-2-3)

EE-359 High Frequency Circuit Design
Students are taught to design, build and test microwave amplifiers using S-parameters and Smith Charts in conjunction with modern circuit design and simulation software. Both bipolar and field effect transistors are used to design amplifiers to specifications regarding signal flow gain, noise figure and intercept point. Students fabricate microstrip circuit boards using an in-house milling machine and then test the completed amplifiers in the laboratory. Actual and simulated results are presented. Prerequisite: EE-309. (2-2-3)

EE-362 Microcontroller System Design
Study of a state of the art microcontroller and related families. Evaluation board hardware preparation and checkout. PC to board interfaces. Assembler and C-compiler. Configuration registers for code and program protection. On-chip memories. Seerial peripheral interface and parallel I/O routines. A/D converter, real-time interrupts and timer applications. A series of three group projects are required leading up to a final stand-alone project. Prerequisite: EL-262 or microcomputer, micro-assembly background. (2-2-3)

EE-364 Computer Architecture
Design and architecture of modern computers. System components: processor, memory and interfaces. Instruction sets and operations. Reduced instruction sets (RISC) and RISC architecture. Processor design to support RISC instruction set. Evolution to parallel processing and multiprocessing. Prerequisite: EE-304. Offered during spring semester only. (2-2-3)

EE-382 Robotic Systems
An introduction to the design and control of autonomous robots. Mechanical considerations and review. Interfacing issues and programming. Sensors for perception and environmental detection and navigational ability. Students will develop algorithms and use machine learning techniques to generate programs to control electromechanical systems to perform tasks. Team based projects and laboratories. Prerequisites: EL-262. (2-2-3)

EE-400 Special Projects in Engineering
Application of engineering principles of research into a special project. Projects vary from semester to semester. Students primarily work in a guided study environment with a faculty mentor. Prerequisites: permission of instructor and department chair and at least junior standing. This course may be repeated with different projects. (1-4-3)

EE-404 Large-Scale Digital Design
Analysis and modeling of digital systems, VLSI, VHDL timing, objects and classes. VHDL-based design processes, concurrent and sequential assignments. Variable modes and operators, entities and architectures, behavioral descriptions. Dataflow, synchronous and asynchronous processes using procedures and sub-functions. Library support packages and generation of test-bench data. Prerequisite: EE-354. Offered during fall semester only. (2-2-3)

EE-406 Signals and Systems
Mathematical models, systems, signal classifications, I/O differential and difference equations, block diagram realizations, discrete-time systems. Convolutions: discrete-time and continuous-time. The Z-transform in linear discrete-time systems, transfer functions. Trigonometric Fourier series, polar and rectangular forms, odd/even functions, response of a linear system to periodic input. Fourier transform, symmetry properties, transform theorems, linear filtering, modulation theorem. Prerequisite: MA-360. Offered during fall semester only. (3-0-3)

EE-409 Network Analysis and Synthesis
Comparison of analysis and synthesis. Transfer function and frequency response: phase and time delay. Familiarization with complex impedance and admittance functions. Active filter design: bandpass, bandreject, FDNR and gyrator. Impedance evaluation: Foster I, Foster II, Cauer I and Cauer II. Synthesis of Butterwork and Chebyshev filters. Sensitivity of networks to parameter changes. Prerequisites: EE-309 and MA-360 or knowledge of Laplace transforms. (2-2-3)

EE-415 Microwave Theory and Devices
Waveguide theory: modes of operation. Waveguide components: tuners, windows, sifters, tees and couplers, filters, mixers, isolators, circulators. Microwave tubes. Klystrons: multicavity and reflex. Magnetron, traveling wave tubes, backward wave oscillators, amplifier techniques, microwave semiconductors: operations and applications. Microwave measurement techniques. Prerequisite: MA-340 and PH-262. Offered during fall semester only. (2-2-3)

EE-419 Electrostatics
Stationary electric and magnetic fields. Gauss's Law, Laplace and Poisson's equations. Solutions to static field problems. Ampere's Law, Faraday's Law. Prerequisites: PH-263 and MA-340. Offered during fall semester only. (3-0-3)

EE-452 Advanced Microcontroller System Design
Extension of EE-362. Project course utilizing commercially available microcontroller EVB boards. Fuzzy logic introduction. Programming using fuzzy logic rules and high performance design techniques. Students design, select, build, and generate code for microcontroller-based systems. Prototypes are evaluated and debugged before final assembly. Written report and oral presentation required. Prerequisite: EE-362. Offered spring semester only. (1-4-3)

EE-453 Control I
Introductory concepts. Feedback control systems and derivation of transfer function. System response for undamped and damped systems. Testing for system stability, coefficient test, Routh-Hurwitz technique. System performance, system types, steady state error and error coefficients calculation. Design of compensator. System bode plots, crossover frequencies, gain and phase margins. The course will stress use of a variety of famous industrial computer-aided control system design software packages. Prerequisite: MA-360 or knowledge of Laplace transforms. (2-2-3)

EE-456 Digital Signal Processing
Discrete-time methods applied to continuous-time processes. Use of Z, fast-Fourier and discrete transforms. Design methods for digital filters. Digital filter software packages introduced. Prerequisite: MA-360. Offered during spring semester only. (2-2-3)

EE-458 Senior Design Project
Students propose design, create and test a functioning product using engineering standards and realistic constraints. This is a major design experience based on the knowledge and skills acquired in earlier course work. The project includes design reviews as scheduled by the professor, progress reports, and a final project demonstration with oral presentation. Issues such as cost, maintainability, environmental impact, ethical, social, manufacturability and safety must be con-

sidered in developing the final product. For EE, TET, EET, CE and CET programs. CE and CET students should see advisor before registering. Prerequisites: EN-408 and Senior standing. (1-4-3)

EE-459 Electromagnetic Field Theory

Continuation of EE-419. Time-varying electric and magnetic fields. Boundary conditions. Maxwell's equations and applications to wave phenomena. Relation of classical circuit theory to Maxwell's equations. Prerequisite: EE-419. Offered during spring semester only. (3-0-3)

EE-461 Communications Theory

Fourier analysis. Signal and spectral analysis of AM and FM systems. Noise representations; power spectral density and quadrate decomposition. Signal-to-noise improvement in AM and FM demodulators. Maximum likelihood digital signal detection. Signal space representation of modulated signals. Modulated signal detection and bit-error rate calculations for OOK, BPSK, QPSK, QAM, M-ary PSK and M-ary FSK. Prerequisites: EL-261, MA-360 and MA-345. (3-0-3)

EE-463 Control II

Introduction to state diagrams and state equations. Solutions of state equations for simple systems. Root-locus techniques, compensation, optimization of stability and error. Multiparameter root locus. Nyquist criterion and time domain design. System performance indexes: ISE, IAE, ITAE and ITSE. Modern control engineering: state variable methods, controllable and observable/estimator, observer design and design of optimal control system. Prerequisites: EE-453. Offered during spring semester only. (3-0-3)

EE-500 Advanced Signals and Systems

Signal representation using step and impulse functions. Differential equation description of linear systems and classical solutions. Laplace transforms in linear systems. Trigonometric and complex exponential Fourier series. Fourier transforms. Parseval's theorems. State-variable equations and solutions. The sampling theorem and the Nyquist criterion. Using Z-transforms to represent and analyze sampled data systems. (3)

EE-600 Mathematical Analysis

Advanced mathematics for scientists and engineers as either a review or an advanced introduction. Differential equations, Laplace transforms, linear algebra, vector analysis, introduction to tensor analysis, complex variables and probability. Many calculation techniques using MATLAB are introduced. Projects are performed using MATLAB and Simulink. Offered during fall semester. (3)

EE-601 Modern Circuit Design and Simulation

A study of the various SPICE based software tools used by engineers to design and simulate circuits. Analog, digital and mixed simulation. Component selection and modeling use of libraries and customizing components and models. Students design and calculate theoretical results and compare results to simulations. Students will be required to obtain software for purchase. Prerequisite: normal undergraduate course in circuit modeling. Offered during fall semester. (3)

EE-606 Signal Processing

Review of Laplace and Z-transforms. Synthesis of networks from transfer functions. Complex variable theory applied to Z-transforms. Filter design techniques from "brick wall" specifications. Mixed-radix FFT's. Spectral estimation. Quantization theory. Introduction to recursive estimation. Prerequisite: normal undergraduate course in signal processing. (3)

EE-607 Electromagnetic Interference and Compatibility

Overview of Electromagnetic Interference with examples. Conducted and radiated emission. Mutual Capacitance and Inductance. Coupling Paths. Crosstalk. Shielding Theory and Applications. Modeling of circuits in noise applications. Parasitics and their reduction. Ferrite beads and chokes. Open Area Test Sites. Anechoic chambers. TEM cells. Reverberation chambers. Frequency and time domain analysis of noise. Grounding issues and their reduction. Bonding Electrostatic Discharge. Extremely Fast Transients, Surge EMI filteres Cables, Connectors and Components. Electromagnetic pulses and Lightning. Offered during spring semester. (3)

EE-614 Large-Scale Integrated Design

Introduction to VLSI and VLSI CAD software tools. Digital design and logic verification, layout, timing analysis and programing, with synthesis, simulation and verification. Applications change from semester to semester. Subjects included designing ASIC's, DSP, and processor chips. Students design and verify chip. Offered based on demand. Prerequisite: Advanced course in digital chip design equivalent to EE-354. (3)

EE-651 Communications Theory

State-Space Model of Signals. Calculation of bit-error-rate for BPSK, QPSK, M-ary PSK, M-ary Orthogonal Signals. Trellis-Code Modulation and Demodulation (using trellis diagrams). Fading channels and random phase in analog systems. Offered during spring semester. Prerequisite: EE-600 or equivalent. (3)

EE-652 Microcontroller System Development

The course covers both the hardware and software aspect of the 16-bit Motorola microcontroller. Overview of onboard chip components and available instruction sets with emphasis on the newer and enhanced version. Student is required to develop a hardware application and write and test modular code. Software developmental tools will be employed. High level language compliers will be discussed. Students are required to purchase an evaluation board and deliver a final project for testing. (3)

EE-653 Analog and Digital Control Theory

State Equations, Simulation and Modeling, Controllability and Observability, Specification and Structures, Feedback System Stability Classical and Modern Approach, Multivariable Control, Sampled-Data Digital Control System, Impulse Samples, Aliasing, Zero-Order Hold, Z-Transform, Discrete-Time Systems, Sampled-Data Systems, Stability by Jury Criterion, Root Locus, Nyquist Criterion, Discretization of Continuous-Time Design. Prerequisite: EE-600 and EE-601 or equivalent. (3)

EE-656 Image Processing

Two-dimensional Fourier Transforms and Z-Transforms. Two-dimensional convolution. Filtering and masking. Discrete Cosine transforms, Haddamard transforms, Karhunen-Loeve transforms. Radon transformations. Contour estimation (Sobel, Snake algorithm). Motion estimation and compensation. Compression techniques (JPEG,MPEG). Prerequisite: EE-606. (3)

EE-665 Microwave Circuit Theory and Design

Transmission lines, two port networks scattering parameters. Measuring scattering parameters. The Smith Chart and impedance matching. Impedance matching circuits. Microstrip design. Microwave amplifiers. Broadband amplifiers. Applications to broadband circuit design. Prerequisite: EE-601 and EE-607. (3)

EE-708 Master's Project Research

This course will cover all aspects of proposing and executing a research and development task, in respond to Broad Agency Announcements. Creating preliminary response, including quad charts and white papers. Techniques for providing a rough order of magnitude (ROM) cost. Preparing the full final proposal, including abstract, statement of work, schedule, milestones, deliverables, risk mitigation, preplanned follow-on efforts, procurement, subcontracts, describing the labor mix, and developing a full cost proposal. Attention will be given to protection of proprietary information, protection of intellectual property, and to compliance with Federal Acquisition Regulations (the FAR). The course will culminate with the execution of a mock project, with final deliverables, and final closeout of the project. Examples from Federal R&D projects in public domain will be used throughout the course. Offered during fall semester. (3)

EE-710 Design for Reliability and Manufacturing

Design methodology and standards applied in the construction and assembly of electronic circuits for reliability. Redundancy, parallel structure and majority rule circuits. Materials and component selection. Vibrational analysis, thermal analysis and packaging. Classification of hardware for commercial, military or space applications. MIL-spec and IPC standards discussed. Normally offered during summer semester. (3)

EE-720 Designing for Testability

Design for testability. Types of testing, functional testing, and structural testing. Automatic test pattern generation. Scanning and scan based design rules. Critical paths. Memory test and diagnostics. Built-in self-testing. ATE equipment, local and remote testing and limitations. Students will have access to on-line test workstations. Normally offered during summer semester. (3)

EE-758 Master's Project

Students integrate prior course work and personal experiences into a master's project. Students develop a full final proposal, including abstract, statement of work, schedule, milestones, deliverables as learned in EE-708. Proposal must be delivered to class and approval of project advisor required. Regular progress reports required. Final presentation will be live over the Internet. Offered during spring semester. Prerequisite: EE-708. (3)

EL-100 Introduction to DC/AC Circuits

Basic electrical concepts and laboratory techniques. Current, voltage, resistance and power. Ohm's law, series and parallel resistive circuits. Kirchhoff's voltage and current laws. Loading effects on meters and supplies. Capacitors and Inductors. Charging and discharging. RC and RL time constants. Introduction to AC. Sinusional waveforms, phasors and use of the J operator. Reactance and admittance. Average values and RMS. Laboratory emphasis is on the proper use of standard meters, testing equipment and circuit breadboarding. Corequisite: MA-114. (2-2-3)

EL-150 DC/AC Circuits and Analysis

Applications of Kirchhoff laws to multiple source and complex series-parallel circuits. Determinants and matrices. Mesh and nodal analysis. Network Theorems: Thevenin, Norton, superposition, maximum power transfer. Review of complex number manipulation. Application to capacitive and inductive circuits, impedance. Complex Mesh

analysis. Network theorems applied to complex RLC networks. Frequency response of RL and RC circuits. Plotting frequency response. Bode plots. Laboratory emphasis on the use of standard test equipment to verify theory. Prerequisites: EL-100 and Math (MA-114 or MA-114 Placement Test equivalent or MA-261 or MA-261 Placement Test equivalent). (2-2-3)

EL-200 Electronic Devices and Circuits
Principles and characteristics of semiconductor devices. Devices covered include diodes, Zener diodes, bipolar junction transistors, field-effect transistors, and operational amplifiers. Includes bias networks, operating points, maximum output and optimum bias, and DC and AC load lines. Input and output impedances, and voltage and current gains for each amplifier configuration. Prerequisite: EL-100 or EE-159. (3-2-4)

EL-204 Digital Electronics

Number systems, including binary, octal and hexadecimal bases. Binary arithmetic. Boolean algebra, Karnaugh map simplification. Design of combinational circuits. Decoders, multiplexers, flip-flops and other multi-vibrator circuits. Logic families including TTL, CMOS, ECL and others. Memory, shift registers and counters. (2-2-3)

EL-212 Transmission Lines

Study of transmissions lines: characteristic impedance, propagation constant, standing wave ratio and reflection coefficient. Transmission line response to transients. Bounce diagrams. Lossless and lossy line analysis using classical approach as well as graphical approach (Smith Chart). Voltage and power calculations on transmission lines. Matching techniques for transmission lines and discrete circuits. Measurements using vector network analyzers. Prerequisite: EE-159 or EL-150. Offered spring semester only. (2-2-3)

EL-220 Fabrication and Troubleshooting

Covers the basic methods of circuit construction and troubleshooting, including IC fabrication, wire wrapping, soldering, etching and chassis layout. Identification and removal of components; project oriented; may be used as a technical elective. Prerequisite: EL-100. (1-4-3)

EL-250 Advanced Analog Circuits

Amplifier theory. Analysis of circuits in small signal operation, equivalent circuit models, frequency response and Bode plots. Cascaded stages with direct, capacitor and transformer coupling of amplifier stages, loads and signal sources. Analysis of power transfer, efficiency, thermal effects, and distortion of amplifier circuits in large signal operation, amplifier operating classes and push-pull amplifier circuits. Operational Amplifier applications. Regulators. Oscillators: Wein Bridge, RC phase shift, Hartley, Colpitts, Clapp, Negative resistance and crystal types. Prerequisites: EE-159 or EL-150 and EL-200. (3-2-4)

EL-255 Introduction to Control and Robotics

Open and closed loop control systems compared with examples. Conditions, which determine a robot. Permanent magnet, brushless, series and shunt motors. Stepper motors. Reversing circuits and speed control techniques. Gear trains and effect on speed, acceleration and torque. Robot power supplies, robot arm and gripper, degrees of freedom and work envelope. Frequency response of control system components. Introduction to Power electronics. Transducers used in robotics. Prerequisite: EL-150 or EE-159 and EL-200. (2-2-3)

EL-261 Introduction to Communication Circuits and Systems

Fundamental concepts in communications. Amplitude and frequency modulation. Waveform and waveform analysis. Spectral content of signal. Circuits used to generate signal. Signal recovery circuits. Introduction to digital modulation and digital waveforms. Students build and test circuits. Prerequisites: EE-159 or EL-150, and EL-200. Corequisite: MA-261. Offered during spring semester only. (2-2-3)

EL-262 Microprocessors and Microassembly

Introduction to microprocessors. Architecture. Fetch and execute cycles. Microprocessor instruction set and assembly language programming. Hardware configuration, pin functions and modes of operation of a typical microprocessor. Basic I/O timing, control and memories. Prerequisite: EL-204. (2-2-3)

EL-301 Advanced Communication Circuits and Systems

A continuation in the study and analysis of communications circuits as they apply to communications systems. Circuits such as voltage controlled oscillators, modulators, mixers, phase-locked loops, frequency synthesizers, passive and active filters are analyzed and mathematically discussed. Students build and test their circuits. Prerequisites: EL-250, EL-261 and MA-261. Offered during fall semester only. (2-2-3)

EL-307 Noise and Shielding

Noise types and specifications. Natural, manmade and intrinsic noise sources. Thermal, shot, contact, popcorn and avalanche noise as related to electronic devices. Reactive network effects on thermal noise. Signal-to-noise ratio, noise figure, noise factor, noise temperature and noise bandwidth. Low noise design techniques, measurement techniques for noise factor and noise bandwidth. Ground loops and how to eliminate them. Grounding techniques, shielding, digital circuit radiation, electrostatic discharge and electromagnetic pulse. Prerequisites: EL-261. (2-2-3)

EL-400 Special Projects in Technology

Guided Study. Project-oriented course. Students are expected to design and build electronic systems in their specialization. Students will produce a final project including a written report and an oral presentation. Prerequisite: permission of instructor. (0-6-3)

EL-452 Automated Test Systems

Systems design course for automating the testing of electronic circuits and systems in both the engineering and production environments; stresses both hardware design and system software development. Begins with simple PC-based systems assembly for circuit testing as part of the design process and progresses to the design and development of full-scale systems for testing of large production volumes. Detailed study of the operation of the IEEE STD-488 and its use in test systems assembly. Prerequisites: CS-130. Offered during spring semester only. (2-2-3)

EN-001 Basic Writing Skills

This course covers the basic skills of written expression, reading comprehension and vocabulary building, which will enable the students to clearly present feelings, ideas and opinions. It includes a review of spelling, punctuation, and word usage plus sentence construction and other basic writing skills. Students will be expected to complete numerous short writing assignments with an emphasis on paragraphs. Study skills are also stressed. This course is required of all students whose test scores and writing samples indicate the need. This course provides three semester credits but does not meet the AAS, BS degree requirements for graduation. Grades given will be P-pass or R-repeat. (3-0-3)

EN-002 Reading Development

This course is designed to provide students with the skills they need to develop their comprehension of the written word. Content will include: expansion of written and spoken vocabulary, improved reading comprehension and the promotion of critical thinking. The course will focus on teaching students to use active strategies such as graphic organizers, SQ3R, Cornell Note-Taking, text-marking and annotating. The reading will be focused on non-fiction materials to increase knowledge in specialized areas. This course provides three semester credits but does not meet the AAS, BS degree requirements for graduation. Grades given will be P-pass R-repeat. (3-0-3)

EN-101 English Communications I

This introductory college-level course focuses on effective oral and written communication skills and the development of analytical abilities through various reading and writing assignments. Students must be able to demonstrate competence in writing mechanics, including grammar, structure and logical content development when writing essays, summaries, and short reports. Rhetorical modes may include description, compare/contrast, personal experience, definition, illustration and process demonstration. Oral presentation skills are developed through the delivery of two speeches on related topics. Prerequisites: acceptance based on placement test scores. (3-0-3)

EN-102 English Communications II

This sequel to EN-101 involves more sophisticated research, reading, writing, and speaking assignments. Emphasis is on summarizing and analyzing short articles, including one in-class analysis. Students will demonstrate competence in research and documentation methods by conducting one major research project during the semester. Prerequisite: EN-101. (3-0-3)

EN-408 Writing Seminar in Technical Research

This course prepares the student for the Senior Design course. It requires the application of certain basic principles in developing documentation needed for technical communication. Each student must be able to identify a particular problem and devise a proposal for solving it. A series of written assignments should provide a thorough literature review and analysis of relevant issues, expert opinions, and the author's (student's) recommendations for solving the problem. Students are also expected to present their work via oral presentations. Prerequisite: EN 102 and senior status (earned 96 or greater credits). (3-0-3)

EN-409 Writing Seminar in Management and Cybersecurity

This is a project-oriented course requiring the application of certain basic university principles in developing a major research paper in the student's academic area. Each student must devise an original research-based approach for solving a technical problem. The research paper should provide a thorough literature review and analysis of relevant issues, expert opinions and the aurthor's recommendations for solving the problem. Emphasis will be placed on the properly formatted, comprehensive final research paper, complete with supporting documentation. Formal presentations are required. Prerequisite: EN-102 and senior status (96 or greater credits earned.) This course is limited to BSCIS and BSMCIT seniors preparing for senior project. (3-0-3)

ENI-101 English Communications I – Intensive

This introductory college-level course focuses on effective oral and written communication skills and the development of analytical abilities through various reading and writing assignments. Students must be able to demonstrate competence in writing mechanics, including grammar, structure and logical content development when writing essays, summaries, and short reports. Rhetorical modes may include description, compare/contrast, personal experience, definition, illustration and process demonstration. Oral presentation skills are developed throughout the delivery of two speeches on related topics. Prerequisite: acceptance based on placement test scores. (3-0-3)

ENI-LAB English Communications Intensive Lab

Based on placement test scores, students in this lab will focus on specific areas for improvement including punctuation, grammar, verb formation and usage. Must be taken with EN-001 and ENI 101, and can be taken with EN 101. (0-1-0)

FS-100 Freshman Seminar

Throughout this course students will learn skills to better prepare them for the rigors and challenges of college. Students will learn and practice various proven techniques and tools to help them be successful with college level work. Additionally students will explore the personal characteristics necessary for success, learn about the college culture, and develop a support network. (2-0-1)

HP-252 Critical Issues US History I

This is a survey course designed to give students an overall view of the development of the United States from the time of its founding through the Civil War. This course is directed toward the emergence of American political, economic, and social traditions through critical analysis and student research. Prerequisite: EN-101. (3-0-3)

HP-253 Critical Issues in US History II

This is survey course designed to give students an overall view of the United States from after the Civil War until recent history. This course is directed toward the emergence of American political, economic, and social traditions through critical analysis and student research. Prerequisite: EN-101. (3-0-3)

HU-163 Horror Fiction

This course offers the student a survey of horror fiction beginning with Edgar Allan Poe and ending with present-day writers such as Stephen King. Students read short stories as well as novels. The translation of horror literature into film is also examined. Prerequisite or Corequisite: EN-101. (3-0-3)

HU-164 Science Fiction

This course will examine science fiction from the early 20th century to the present, with some attention to the cultural and historical issues that shaped its development. Special attention will be placed on the role of science in science fiction. The relationships between literature, film and television as expressions of science fiction will also be studied. Prerequisite/Corequisite: EN-101. (3-0-3)

HU-165 History Through Fiction

This course provides a broad survey of a selected historical period and compares/contrasts fictional historical accounts with what is generally regarded as historical fact. Both oral and written presentations are required of students. The selected time period and associated literature is chosen by the professor, and will vary over time. Students will learn to distinguish between historical fact and fiction, as well as to apply critical thinking toward identifying the fine lines that often exist between disparate accounts of history. Prerequisite: EN-101. (3-0-3)

HU-175 Ancestral Research

This course offers students a survey of library research methods and tools to do research on their family through the use of electronic resources. Students will learn how to document their finds, conduct oral interviews and utilize governmental records and resources. Students will conduct genealogical research to find their "roots" both in the United States as well as overseas. Students will be required to do oral and written presentations discussing their family research. Assignments will direct students in documenting research, utilizing proper research methods and forms and developing their own "family tree." Corequisite: EN-001 or EN-101. (3-0-3)

HU-205 Twenty-First Century Mass Media

A broad survey of contemporary mass media such as film, radio and television with particular attention paid to emerging media such as the Internet, related technological and commercial infrastructures, as well as the globalization of the new media. Corequisite: EN-101. (3-0-3)

HU-210 Game Design and Theory

This course teaches how to design a standalone game that is balanced, playable and has that intangible of 'fun'. Topics include history of games, player psychology, mathematical game theory, topology, statistics, multiplayer interactions, and art and aesthetics. We also cover the milestones needed to produce a game. Each student will take their concept from idea to creating their choice of a tabletop game or a paper prototype for a future marketable game. (3-0-3)

HU-220 Critical Thinking

This course explores the process of thinking critically and guides students in thinking more clearly, insightfully and effectively. Concrete examples from personal experience and contemporary issues help students develop the abilities to solve problems, analyze arguments and issues, as well as make informed decisions in their academic career and personal lives. Readings, structured writing assignments and ongoing discussions help students develop sophisticated thinking abilities. Prerequisite: EN-102. (3-0-3)

HU-225 Writing for the Internet

This course introduces students to writing for the Internet allowing more effective online communication in such forums as blogs and Websites. Students will learn how to write in a more active voice, bringing more energy and vibrancy to their articles and commentaries. Course material examines the work flow and demands of Internet writing and publishing. Students will learn how to launch their own blog and develop an audience as well learn how to prepare articles for other blogs and web sites. This course is designed for all students, regardless of their communication, writing, or journalism experience. This is not a Web design course. Prerequisite: EN-101. (3-0-3)

HU-310 African American Literature

Introduction to African American Literature will trace the development of an African American literary tradition. Study includes major genres of black writers: plays, poetry and fiction. Prerequisite: EN-102. (3-0-3)

HU-331 Arts and Ideas

This course enables students to study and appreciate various forms of art, including painting, sculpture, architecture, music, drama, film, and literature through in-class and on-site experiences. The arts are also surveyed from an historical perspective, focusing primarily on eras in Western civilization. This enables students to sense the parallel development of the arts, of philosophy, and of sociopolitical systems and to recognize various ways of viewing reality. Prerequisite: EN-102. (3-0-3)

HU-332 Arts and Ideas: Special Topics

This course has the same general requirements as HU-331, but the orientation of the course will be on alternate traditions to the Western canon. Students will study various forms of art, including painting, sculpture, architecture, music, drama, film, and literature through in-class and on-site experience. Students will gain an appreciation for the arts as they are represented by a particular culture or national identity. The course will concentrate on how the arts are shaped by cultural/ social forces that result in distinct philosophies and ideologies. Prerequisite: EN-102. (3-0-3)

HU-364 Science Fiction Literature

This course will examine science fiction and social commentary. Special attention will be placed on critical analysis and discussion on the role of science fiction in determining the impact of social growth and events in modern society. Prerequisite: EN-102. (3-0-3)

HU-365 Mystery Literature

This course will examine the genre of mystery literature from the early 20th century to the present, with some attention to mystery writers prior to this time period who built the foundation of the genre. Special attention will be given to the elements of a mystery story, the characters and plot development of the "who done it" through reading of popular authors as well as classical authors. Also the class will look at the relationships between mystery literature, film and television as literary art forms. (3-0-3)

HU-400 Humanities: Special Topics

Research into humanities. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. Prerequisite: EN-101. (3)

IAE-201 Introduction to Information Assurance Concepts

This course covers topics related to administration of network security. Topics include a survey of encryption and authentication algorithms; threats to security; operating system security; IP security; user authentication schemes; web security; email security protocols; intrusion detections; viruses; firewalls; Virtual Private Networks; network management and security policies and procedures. Laboratory projects are assigned as part of the homework requirements. Corequisites: MA-110 or MA-114 or MA-261 and EN-101. (3-0-3)

IAE-301 Comprehensive Computer and Network Security

Building on IAE-201, this course provides learners with detailed and hands-on knowledge of computer and network security. The course emphasizes current topics such as network security, compliance and operational security, threats and vulnerabilities, application security, access control, as well as cryptography. Additionally, underlying theory and concepts are presented in order to extend learners' understanding of computer and network security. Weekly laboratory exercises are utilized to reinforce practical, real-world security techniques. Classes are a mixture of lecture, current event discussions, and laboratory exercise review and will prepare learners for the CompTIA

Security+ certification. Pre-requisite: IAE-201 (3-0-3)

IAE-310 Strategies for Cyber Competition

This course prepares students to participate in national and international cyber competitions. Two competition archetypes, are explored in detail: Capture The Flag (CTF) and Jeopardy. Students will gain practical experience in these competition archetypes, as well as specific competition subtypes, through a rigorous schedule of hands-on challenges, laboratory exercises, and full scale competitions. This course will explore strategies of game play within the competition archetypes, review the skills necessary to compete in cyber competitions, as well as the cognitive science that empowers competitions as learning devices. Individual classes will be a mixture of lecture, laboratory exercises, as well as puzzle solving. The course will conclude with students participating in a real cyber competition. Prerequisites: IAE 201, IAE 301 or permission from Professor.

IAE-311 Mobile Computing Security

Emphasizing wireless computing security, this course addresses how to secure mobile wireless computing devices and applications and wireless network security as it impacts those portable computing devices. Wireless network security is discussed as it pertains to decisions on which network security works best with particular applications loaded into wireless computing devices. The course covers security of CMRS and PCS (Cellular Mobile Radio Service and Personal Communications Service), CMRS and PCS second, third and fourth generations (2G, 3G and 4G) , laptops equipped with Wireless Network Interface Cards (WNICs), Personal Digital Assistants (PDAs), Bluetooth and Zigbe devices and "Radio Frequency Identity (RFID) devices. Retail store security and proximity payment application security are also discussed. Note: students are required to purchase a mobile device specifically to fulfill course lab requirements. Prerequisite: IAE-301 (2-2-3)

IAE-315 Secure System Administration and Operation

This course introduces students to security settings and requirements of Linux and Windows-based systems and web services. It also introduces students to Linux and Windows-based web services, including methods of configuring, testing the security and the implementing of countermeasures to discovered vulnerabilities. Topics include Linux security settings, IP tables, securing IIS web service, securing Apache web service, access control methods and host auditing and tools. Prerequisites: CT-152 and IAE-301 (3-0-3)

IAE-320 Mobile Device Forensics

Mobile device forensics is a branch of digital forensics relating to recovery of digital evidence or data from a mobile device under forensically sound conditions. The scope of devices can include mobile phones and any digital device that has both internal memory and communication ability, including PDA and GPS devices and tablet computers. This course focuses on the forensic study of mobile devices due to the rapid proliferation of smartphones and applications such as contacts, photos, calendars and notes, SMS and MMS messages, video, email, web browsing information, location information, and social networking. This increased usage has also seen a marked increase in cybercrime involving smartphones. Students will learn how to perform the forensic examination of mobile devices using the most advanced tools available. Note: Students are required to purchase a mobile device specifically to fulfill course lab requirements. Prerequisite: IAE 301, 311 (3)

IAE-321 Applied Wireless Network Security

This course will explore the unique challenges presented by wireless networking, including the management of dual network devices (Bluetooth, 3G, 4G, and WiFi). Students will evaluate emerging business and technical initiatives, such as bring your own device (BYOD) and securely implement mobile IP networks based on IPv4, IPv6 and the 3GPP. Students will learn penetration testing strategies to effectively evaluate currently implemented security controls, utilizing cutting edge tools such as BackTrack 5, Vistumbler, Wireshark, and inSIDDer for network discovery and packet analysis. Additionally, students will be exposed to the site survey, network management and analysis capabilities of industry leading software such as Air Magnet, Ekahau and OmniPeek. Students are required to purchase an Alfa wireless adapter and acquire a wireless router for this class. Prerequisites: IAE-301, CT-152. (3-0-3)

IAE-325 Secure Data Communications and Cryptography

This course follows the protocol education provided in IAE-301 with a more detailed and practical look at secure transactions and correspondence, as well as protection of data in storage. Within the confines of the ISO-OSI model, this course discusses data communication with emphasis on the security available at the layers, secure sockets layer, and both wired and wireless security topics. One-way message digests/hashes and encryption history and protocols are explored in-depth. Topics include virtual private networks, one-way hashes/message digests, digital signatures, secret-key and public key cryptography processes and algorithms. Prerequisite: IAE-301 and CT-152 (3-0-3)

IAE-335 Advanced Secure Data Communications

In today's world it is nearly impossible to not be connected in one way shape or from to the Internet. Students will be introduced to multiple methods of secure communication using the Internet and how to minimize the impact of being tracked. In addition, Students will be introduced to methods, tools, techniques, and tricks on how to remain anonymous while using untrusted mediums such as the Internet. Students will learn through lecture, labs, and real-world exercises. Prerequisite: IAE-301 and IAE-325 (3-0-3)

IAE-351 Intro to Cyber Network Operations

Full spectrum information superiority and dominance is key to influencing operations associated with war or Military Operations Other Than War (MOOTW). This survey of Computer Network Operations (CNO) introduces the concept of how Computer Network Attack (CNA), Computer Network Defense (CND) and Computer Network Exploitation (CNE) are leveraged to collect information, disrupt, deny, degrade or destroy the information within computers and computer networks and/or the computers/networks that host them. Strategic and operational considerations will be considered to affect an adversary's decision cycles with information superiority. Prerequisite: IAE-301. (3-0-3)

IAE-372 Cryptography

Cryptography is indispensable for providing confidentiality of information in computer systems. This course explains the inner workings of cryptographic primitives and how to correctly use them. Students will learn how to reason about the security of cryptographic constructions and how to apply this knowledge to real-world applications. Students will examine many deployed protocols and analyze mistakes in existing systems. The course discusses public-key techniques that let two or more parties generate a shared secret key. Students will cover the relevant number theory and discuss public-key encryption and basic key-exchange. Prerequisite: IAE-301, MA-114 (3-0-3)

IAE-400 Special Topics in Information Assurance

Research into information assurance subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. This course may be repeated with different projects. Prerequisite varies. (1-4)

IAE-402 Introduction to Incident Handling and Malicious Code

This course provides a detailed understanding of incidents from attacks of malicious software. This course addresses the history and practice of coding that occurs in viruses, worms, spyware, Trojan horses, remote management back doors and root kits. Students learn preventative measures and tools, and explore how to rid systems of malicious software and prevent re-infection. Recovery processes and backup methods are explored. In addition to covering basic incident handling preparation, response and recovery practices, and the course goes into detail regarding malicious software. Prerequisite: IAE-315 (3-0-3)

IAE-405 Malware Analysis/Reverse Engineering

This course introduces students to malware research and analysis. The course will provide students an overview of malware research, intelligence gathering related to malware, and provide students basic skills required to analyze and dis-assemble malicious programs. Students will explore the tools required for analysis and reverse engineering of malicious code, learn malware defense techniques, how malware functions, and will perform live analysis and reverse engineering exercises. Prerequisite: IAE-402 (3-0-3)

IAE-406 Digital Forensics and the Investigative Process

Students explore forensics and the investigation processes. Students explore current computer forensics tools, conduct live computer forensic analysis, conduct e-mail investigations, recovery of graphics files and data carving, and engage in report writing for high-tech investigations. Prereq-uisites: IAE-315 and IAE-402. (3-0-3)

IAE-410 Penetration Testing

This course explores the foundational concepts, methods and techniques in preparing and conducting penetration tests. Throughout the course students are introduced to various tools as well as unravel complex methods for exploiting client-side, service side and privilege escalation attacks. Most importantly students learn how to construct a final report outlining discovered vulnerabilities, make suggested recommendations to remediate and/or mitigate those vulnerabilities. Students also learn how to describe the findings wherein non-technical personnel understand the ramifications of these vulnerabilities in a business sense. Prerequisites: CT-240 and IAE-315. Recommended corequisite: IAE-402. (3-0-3)

IAE-412 File System Analysis

This course explores the rudimentary foundations of data structures, encoding, FAT16/32, exFAT, NTFS, EXT2/3/4, and UFS1/2 file systems as well as a look into volume analysis, including multiple disk volumes and volume spanning. This course also discusses the basic fundamentals of hard disk drives and solid state drives, their components and their role in information systems. Prerequisites: MA-111 or MA-114 and IAE-315. (3-0-3)

IAE-440 Secure Access and Identity Management

Students will learn fundamental and advanced IdM (Identity Management) topics, concepts

and current issues. The course will prepare the students for real-world IdM challenges faced by professionals in industry and government today. Students will leave the course with an awareness and understanding of a variety of topics pertaining to IdM, including broad technical aspects, legal and policy issues, implementation scenarios, case studies and industry and government applications of IdM components. Students will be provided hands on design, implementation and operations of ICAM systems in a lab environment. Prerequisite: IAE-301 (3-0-3)

IAE-458 Senior Design Project
Student proposes, designs, builds and tests a working software project. Students write a report according to specifications and deliver an oral presentation for review. This is for CIS and MCIT seniors or must have dean approval. Prerequisite: EN-408 and senior standing. (3-0-3)

IAE-480 Perimeter Protection
In this Defense-in-Depth course, firewalls and network IDS issues will be discussed. A detailed understanding of firewall configuration and rule sets, load balancing, web farms, wireless access, web security issues and network intrusion detection will be explored to prepare the student with the basic tools to coordinate the design and implementation of perimeter network defenses for a high-volume, high-access site. Prerequisite: IAE-402 and IAE-406 (3-0-3)

IAE-500 Intro to Information Assurance
This course will provide the requisite computer, data communications, Internet and database skills to students embarking on careers in information assurance (IA), at the senior levels. It is designed primarily for professionals who seek concentrated professional education in one or more of the many fields associated with IA. Students who complete this course successfully will be able to master the more technical application and analysis skills demanded by the Master of Science in Information Assurance (MSIA) degree program, and the several certificate programs offered in various IA concentrations. Labs, simulations and special problems will be used throughout the course.

IAE-571 Software Assurance Assessment
This course covers the fundamentals of establishing a required level of software and system assurance, applying methods and determining measures to assess whether the required level of assurance has been achieved. Topics include assessment methods; defining product measures, process measures and other performance indicators; measurement processes and frameworks; performance indicators for business survivability and continuity; and comparing selected measures to determine whether the software/system meets its required level of assurance. These fundamentals are applied to newly developed software and systems as well as during the acquisition of software and services. (3)

IAE-572 Software Assurance Development
This course covers the fundamentals of incorporating assurance practices, methods, and technologies into software development and acquisition life-cycle processes and models. With this foundation, the course provides students with rigorous methods for eliciting software and system assurance requirements, using threat identification, characterization, and modeling; assurance risk assessment, and misuse/abuse cases. Students will also learn how to evaluate methods and environments for creating software and systems that meet their functionality and security requirements. (3)

IAE-573 Software Assurance Management
This course covers the fundamentals of software and system assurance management, including making the business case for assurance; planning and managing development projects that include assurance practices; compliance with laws, regulations, standards and policies related to assurance; and risk assessment, identification, analysis, mitigation and monitoring for assurance. The focus is on how to manage business and technical requirements. (3)

IAE-574 Assured Software Analytics
This course covers methods for assuring the security and functionality of existing software and services, whether legacy, internally developed, or externally acquired, with emphasis on detection of vulnerabilities and malicious content. It also discusses assurance considerations for system architectures, networks and databases in their role as underlying enablers of software operations. Methods for structuring and reverse engineering of existing software are covered, as are techniques for acquiring and assuring software and services through suppliers, service-oriented architectures and cloud computing environments. (3)

IAE-600 Special Topics in Information Assurance
Research into information assurance subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. This course may be repeated with different projects. (1-4)

IAE-605 Master's Research
This is part one of a two course sequence in research and writing. In part one, students work to identify a research topic and, as initial research begins, they investigate the requirements for maintaining a research journal, writing a research paper, and presenting a research paper. Students may petition for job-related substitute course.(3)

IAE-610 Advanced Penetration Testing
This course explores the foundational concepts, methods and techniques in preparing and conducting penetration tests. Throughout the course you will be introduced to various tools as well as unravel complex methods for exploiting client-side, service side and privilege escalation attacks. Most importantly you will learn how to construct a final report outlining discovered vulnerabilities, make suggested recommendations to remediate and/or mitigate those vulnerabilities. You will also learn how to describe the findings in a way that non-technical personnel understand the ramifications of these vulnerabilities in a business sense. Prerequisite: IAE 685 (3)

IAE-611 Mobile Computing Security
Emphasizing wireless computing security, this course addresses how to secure mobile wireless computing devices and applications, and wireless network security as it impacts those portable computing devices. Wireless network security is discussed as it pertains to decisions on which network security works best with particular applications loaded into wireless computing devices. The course covers security of CMRS and PCS (Cellular Mobile Radio Service and Personal Communications Service), CMRS and PCS second, third and fourth generations (2G, 3G and 4G), laptops equipped with Wireless Network Interface Cards (WNICs), Personal Digital Assistants (PDAs), Bluetooth and Zigbe devices, and Radio Frequency Identity (RFID) devices. Retail store security and proximity payment application security are also discussed. Prerequisite: IAE-685. (3)

IAE-620 Mobile Device Forensics
Mobile device forensics is a branch of digital forensics relating to recovery of digital evidence or data from a mobile device under forensically sound conditions. The scope of devices can include mobile phones and any digital device that has both internal memory and communication ability such including PDA and GPS devices and tablet computers. This course focuses on the forensic study of mobile devices due to the rapid proliferation of smartphones and applications such as contacts, photos, calendars and notes, SMS and MMS messages, video, email, web browsing information, location information, and social networking. This increased usage has also seen a marked increase in cybercrime involving smartphones. Students will learn how to perform the forensic examination of mobile devices using the most advanced tools available. Note: Students are required to purchase a mobile device specifically to fulfill course lab requirements. Prerequisite: IAE 685` (3)

IAE-621 Applied Wireless Network Security
This course provides students with practical, real-world experience with an understanding of wireless fundamentals, wireless network threats, tools to test wireless security, and safeguards. Specifically, this course addresses the most popular hacking, cracking and wireless security network analysis tools and trains students to use them to test and secure wireless networks. Current industry best practices for managing wireless networks in a secure environment are addressed. Students need access to a second computer (for hacking) and will be required to purchase and install wireless network equipment to create a home wireless network for the purpose of conducting experiments on various wireless security vulnerabilities and countermeasures. NOTE – students must have access to a computer network they personally own and can modify. Case studies will be used throughout the course. Students are required to purchase an Alfa wireless adapter and acquire a wireless router. Prerequisite: IAE-685 (3)

IAE-630 SCADA Networks and ICS Security
Industrial Control Systems (ICS) have been in existence for decades in the United States. These systems are relatively unknown to the general public and were designed to control our critical infrastructure such as utilities (electricity, nuclear power, and water treatment plants). Until recently, these systems were connected to company networks by privately owned IT networks based on private line technology. Public utility companies have begun to connect ICS networks to public networks such as the Internet as they transition to TCP/IP based networks. This trend is accomplishing the much needed modernization of the nation's IT networks supporting the critical infrastructure and setting the groundwork for developing the federally mandated Smart Grid. The ICS network transition to public networks has many benefits and risks. The increased risk to the smart grid must be addressed by the USG partnering with private industry. Prerequisite: IAE 685 (3)

IAE-640 Secure Access and Identity Management
Students will learn fundamental and advanced IdM (Identity Management) topics, concepts, and current issues. The course will prepare the students for real-world IdM challenges faced by professionals in industry and government today. Students will leave the course with an awareness and understanding of a variety of topics pertaining to IdM, including broad technical aspects, legal and policy issues, implementation scenarios, case studies, and industry and government applica-

tions of IdM components. Prerequisite: IAE 685 (3)

IAE-651 Intro to Cyber Network Operations
Full spectrum information superiority and dominance is key to influencing operations associated with war or Military Operations Other Than War (MOOTW). This survey of Computer Network Operations (CNO) introduces the concept of how Computer Network Attack (CNA), Computer Network Defense (CND), and Computer Network Exploitation (CNE) are leveraged to collect information, disrupt, deny, degrade, or destroy the information within computers and computer networks and/or the computers/networks that host them. Strategic and operational considerations will be considered to affect an adversary's decision cycles with information superiority. Prerequisites: IAE-685. (3)

IAE-670 Network Systems Security Concepts
This course explores security terms, definitions, concepts, and issues that face industries today. This course also will examine how the concept of security, and being secure, integrates into the overall enterprise mission. The importance of user involvement, security training, ethics, trust, and informed management will be explored. (3)

IAE-671 Legal Aspects Computer Security and Information Privacy
This course provides an overview of the legal rights and liabilities associated with operation and use of computers and information, including the legal and regulatory compliance issues critical for chief information security officers. It discusses the key statutes, regulations, treaties, and court cases (in the United States and abroad) that establish legal rights and responsibilities as to computer security and information privacy. The course also helps students to learn how to reduce their risk of potential legal liability for computer security or information privacy failures, and how to enforce their security and privacy rights against other parties. Case studies and lessons learned from information security failures are used throughout the course. Prerequisite: IAE-670 or IAE-685 (3)

IAE-672 Cryptography
Cryptography is indispensable for providing confidentiality of information in computer systems. This course explains the inner workings of cryptographic primitives and how to correctly use them. Students will learn how to reason about the security of cryptographic constructions and how to apply this knowledge to real-world applications. Students will examine many deployed protocols and analyze mistakes in existing systems. The course discusses public-key techniques that let two or more parties generate a shared secret key. Students will cover the relevant number theory and discuss public-key encryption and basic key-exchange. Prerequisite: IAE 685, CS-620 or permission (3)

IAE-673 Secure Information Transfer and Storage
This course provides the student a history of cryptography from Caesar's cipher to elliptic-curve cryptography of today. Students study public and private key algorithms and understand their functionality, and how they work with network protocols. One-way hashes and digital signatures are discussed, and used by the students in submissions to the instructor. Public-key infrastructure with certificate authorities and web-of-trust infrastructure methods is addressed. It is recommended that students complete IAE-685 before taking this course, but this is not a requirement. Prerequsite: IAE-685. (3)

IAE-674 Security Risk Management
This course begins with an understanding of why risk management evaluations are useful. The general methodologies for security risk assessment and security test and evaluation, including the interviews are discussed and documentation research necessary, the student is provided practical lab exercises to provide a hands-on analysis of a fictitious site. Detection, recovery, and damage control methods in contingency/disaster recovery planning research, documentation and training; methods of and procedures for contingency planning and security policy formulation and enforcement. Prerequisites: Completion of at least 24 credit hours of IAE coursework. This class is best completed in the last term. (3)

IAE-675 Computer Forensics and Incident Handling
This course begins with lectures discussing the laws and rights to privacy by individuals and what organizations may or may not do. Online ethics are considered. It then moves on to understanding incident handling and how incident response teams work, managing trouble tickets, and basic analysis of events to determine if an incident has occurred. It concludes with computer forensics issues and practices, and rules of evidence. Prerequisite: IAE-685. (3)

IAE-677 Malicious Software
This course examines malicious software detection and malicious software defenses including tripwire and signature software techniques. Viruses, worms and Trojan horses, logic bombs, malicious CGI scripts will be discussed. Students will review the anatomy of well-known viruses and worms to understand how they work. Mobile code issues as they apply to web and application technologies and resulting insecurities will be discussed in detail. Students will then review the underlying methodologies used by the anti-virus vendors and freeware offerings to protect electronic assets from harm or other compromise. Co-requisite: IAE-685 (3)

IAE-679 Vulnerability Mitigation
This "Defense-in-Depth" course provides the student detailed understanding of the need for internal and external vulnerability assessment. An integral technical part of any risk management program, this course goes hand-in-hand with the more analytical practices in IAE-674. Co-requisites: IAE-685 . (3)

IAE-680 Perimeter Protection
In this "defense-in-depth" course, firewalls and network IDS issues are discussed. A detailed understanding of firewall configuration and rule sets, load balancing, web farms, wireless access, web security issues and network intrusion detection is explored to prepare the student with the basic tools to coordinate the design and implementation of perimeter network defenses for a high volume, high access site. Prerequisite: Completion of at least 24 credits hours in IAE coursework. This class is best completed in the last term. (3)

IAE-682 Internal Protection
This course explores the protections available to the practitioner through host operating systems and third party equipment and software, to protect the inner network from the attacker who has successfully circumvented the perimeter or from the disgruntled insider. Use of methodologies including host-based intrusion detection methods, audit settings and review PC Firewalls, host operating hardening for Linux and Windows 2000, and Virtual LANs will be reviewed. It is recommended that students complete IAE-685 before taking this course, but this is not a requirement. (3)

IAE-684 Complementary Security
This class explores the overarching security architectures and vectors of information assurance from a management perspective to allow the learner to formulate the basis for sound business decisions. Students gain an appreciation for systems, networks, processes, methodologies, documentation requirements, recovery processes, certification and accreditation processes as well as "best practice" implementation, training and continuous improvement. Discussions in this course give the correct acumen of personnel security, physical security, and technical operational security as these principles relate and interface with information security principles. Defense-in-depth principles also are covered for designing proper physical security programs. At the completion of the course students should be able to manage an IA function and evaluate an organization's Contingency Planning process for adequacy.Prerequisite: IAE-682. (3)

IAE-685 Principles of Cybersecurity
This class explores the overarching security architectures and vectors of information assurance from a management perspective. The course will provide a basic understanding of all aspects involving IA management, needs analysis, risk assessments, policy formulation, security planning, and integrating technologies. Students will gain an appreciation for systems, networks, processes, methodologies, documentation requirements, recovery processes, certification and accreditation processes as well as "best practice" implementation, training and continuous improvement. Discussions in this course will give the correct acumen of personnel security, physical security, and technical operational security as these principles relate and interface with information security principles. Defense-in-depth principles will also be covered for designing proper physical security programs. (3)

IAE-686 Managing Information Security
This class explores the overarching security architectures and vectors of information assurance from a management perspective. The course will provide a basic understanding of all aspects involving IA management, needs analysis, risk assessments, policy formulation, security planning, and integrating technologies. Students will gain an appreciation for systems, networks, processes, methodologies, documentation requirements, recovery processes, certification and accreditation processes as well as "best practice" implementation, training and continuous improvement. Discussions in this course will give the correct acumen of personnel security, physical security, and technical operational security as these principles relate and interface with information security principles. Defense-in-depth principles will also be covered for designing proper physical security programs. (3)

IAE-690 Healthcare Information System Security
This course addresses healthcare IS within the framework of the guiding principles of Information Assurance (confidentiality, integrity, and availability). This course covers the security and privacy controls covering healthcare information systems, preventing loss and unauthorized access to healthcare information within information systems, and protecting the integrity of healthcare data (data-at-rest, and data-in-transit) within information systems. The student will gain and understanding of the mandated regulatory, legal, and governance requirements covering privacy

and confidentiality of healthcare information. The student will also be able to identify and manage risks and conduct Information Risk Assessments pertaining to healthcare information. Prerequisite: IAE 685 or permission. (3)

IAE-692 Mobile Medical Device/Application Security
This course goes into the details of the information security risks accompanying the widespread use of mobile devices and mobile apps in the healthcare community. The student will gain an overall understanding of the inherent security risks associated with patient information medical apps and devices, how to protect healthcare information on mobile devices, including identifying vulnerabilities, associated threats, risks, how to mitigate against those risks; and the regulatory guidelines governing and health and safety risks associated with mobile medical apps and devices, along with the privacy impacts. Prerequisite: IAE 685 (3)

IAE-705 Master's Thesis
This is part two of a two course sequence in research and writing. The course is in graduate seminar format. Students integrate prior course work and personal experiences into researching an approved topic to produce a project-based paper. (Offered as a full semester course.) Students may petition for job-related substitute course. Prerequisite: (AE-605. (3)

IAE-820 Situation Awareness Analysis
This is a course in operational leadership from the long-term perspective to crisis intervention. Class activities will be designed to enhance student awareness of action plan processes leading to effective strategy execution. (3)

IAE-825 Applied Research in Information Assurance
This course prepares students to select topics and conduct successful research in information assurance's many fields. Topics include research such as the Computer Fraud and Abuse Act, the Electronic Communication Privacy Act and the National Research Act. Special considerations governing research using human subjects will be given in-depth treatment. The productive and legally sufficient use of the Department of Homeland Security's new Protected Repository for the Defense of Infrastructure against Cyber Threats (PREDICT) program will be discussed. (3)

IAE-830 IA Research Literature
Learners examine literature and research in the information assurance field. Literature will be examined in the context of both the historical and current environment. Prerequisite: RSC-801.(3)

IAE-835 Information Assurance Strategic Management
Learners examine the objectives, elements and framework of analysis for strategic management of information assurance management. Learners focus on synthesizing information and applying sound judgment. (3)

IAE-837 Contemporary Issues in IA
This course focuses on contemporary issues in the field of information assurance. It examines the ways in which science contributes to the study of significant problems in the contemporary world to help individuals and society make informed decisions about these issues. Students will engage in classroom discussion as well as generate scholarly writing suitable for publication. (3)

IAE-845 Pedagogy and Information Assurance
Learners are introduced to the fundamentals of teaching information assurance. Learners gain experience in course and syllabus development. The development and integration of online labs as an academic component is explored. Learners examine the professional development and training that supports IA. (3)

IAE-860 Advanced Mixed Methods Research
This course builds on the knowledge acquired in RSC-810 and IAE-825. Students will examine research designs in detail, devise methods to conceptualize data collection and measurement instrumentation, as well as examine how to analyze collected data both qualitatively as well as quantitatively. Prerequisite: RSC-825. (3)

IAE-865 Special Topics in Human Resource Management
Learners examine human resource theories and practices in the context of the complex environment of information assurance. (3)

IAE-871 Software Assurance Assessment
This course covers the fundamentals of establishing a required level of software and system assurance, applying methods and determining measures to assess whether the required level of assurance has been achieved. Topics include assessment methods; defining product measures, process measures and other performance indicators; measurement processes and frameworks; performance indicators for business survivability and continuity; and comparing selected measures to determine whether the software/system meets its required level of assurance. These fundamentals are applied to newly developed software and systems as well as during the acquisition of software and services. (3)

IAE-872 Software Assurance Development
This course covers the fundamentals of incorporating assurance practices, methods, and technologies into software development and acquisition life-cycle processes and models. With this foundation, the course provides students with rigorous methods for eliciting software and system assurance requirements, using threat identification, characterization, and modeling; assurance risk assessment, and misuse/abuse cases. Students will also learn how to evaluate methods and environments for creating software and systems that meet their functionality and security requirements. (3)

IAE-873 Software Assurance Management
This course covers the fundamentals of software and system assurance management, including making the business case for assurance; planning and managing development projects that include assurance practices; compliance with laws, regulations, standards and policies related to assurance; and risk assessment, identification, analysis, mitigation and monitoring for assurance. The focus is on how to manage business and technical requirements. (3)

IAE-874 Assured Software Analytics
This course covers methods for assuring the security and functionality of existing software and services, whether legacy, internally developed, or externally acquired, with emphasis on detection of vulnerabilities and malicious content. It also discusses assurance considerations for system architectures, networks and databases in their role as underlying enablers of software operations. Methods for structuring and reverse engineering of existing software are covered, as are techniques for acquiring and assuring software and services through suppliers, service-oriented architectures and cloud computing environments. (3)

IAE-875 IA Implementation
Learner focus is on deployment of information assurance technologies in the organization. Relevant literature and real world deployment is examined. (3)

IAE-880 Special Topics in Information Assurance
This course provides students the opportunity to examine in-depth issues relevant to information assurance.This course may result in a publishable paper in the IA field. (3)

IAE-881 Special Topics II in Information Assurance
This course provides students the opportunity to examine in-depth issues relevant to information assurance. This course may result in a publishable paper in the IA field. (3)

IAE-882 Special Topics III in Information Assurance
This course provides students the opportunity to examine in-depth issues relevant to information assurance. This course may result in a publishable paper in the IA field. (3)

IAE-883 Special Topics IV in Information Assurance
This course provides students the opportunity to examine in-depth issues relevant to information assurance. This course may result in a publishable paper in the IA field. (3)

IAE-884 Special Topics V in Information Assurance
This course provides students the opportunity to examine in-depth issues relevant to information assurance. Students must request a faculty member who is a topic specific expert to facilitate the course. This course may result in a publishable paper in the IA field. (3)

IAE-885 Software Assurance Assessment
This course covers the fundamentals of establishing a required level of software and system assurance and applying methods and determining measures to assess whether the required level of assurance has been achieved. Topics include assessment methods; defining product and process measures and other performance indicators; measurement processes and frameworks; performance indicators for business survivability and continuity; and comparing selected measures to determine whether the software/system meets its required level of assurance. These fundamentals are applied to newly developed software and systems as well as during the acquisition of software and services. (3)

IAE-705 Master's Thesis
This is part two of a two course sequence in research and writing. The course is in graduate seminar format. Students integrate prior course work and personal experiences into researching an approved topic to produce a project-based paper. (Offered as a full semester course.) Students may petition for job-related substitute course. Prerequisite: IAE-605. (3)

IE-701 Principles of Design Engineering Computer Networks
Networking and the Internet have introduced us to a new set of devices and protocols that link personal computers to servers, and servers to servers. This course explores all the hardware and software that drives local and Internet computing. Special emphasis on connectivity and throughput is explored. (3)

IE-703 Thin and Fat Client Deployment with SOA

Client/Server has been extended to multi-tiered environments, distributed communications via CORBA,COM/DCOM, service-oriented architecture (SOA) and Cloud computing models. To examine this shift and to understand the technologies involved, this course focuses on how these models are used to enable thin-and fat-clients as well as Web-based clients on desktops, servers and PDAs. This class will examine the mechanisms employed to bring legacy as well as modern computing to the information economy. (3)

IE-705 Comparison of Operating Systems and Web Servers

This course explores the operating software underlying Internet and intranet computing. The similarities and differences between operating systems and web servers are investigated with a view to choosing the best technology and optimization practices. Topics include NT, 2000 Server, Advanced Server, Windows CE, Unix and versions, Linux, IIS, Apache, third party, and public domain. (3)

IE-707 Network Architecture Convergence Using Wireless

This course investigates the techniques used by successful network engineers to create converged network architectures and provide optimum information access to their users. The course will provide an in-depth study of the current and contemplated mobile technologies that can facilitate network convergence. Students will test these mobile technologies and their applications via the virtual laboratory concept using OpNet, the most advanced network modeling software currently available. Technical information on specific equipment and software will be provided as instruction supplemental to the textbook, and case studies will be used throughout the course. (3)

IE-709 Comparison of Object-Oriented and Scripting Languages

For the first time in two decades, software developers now have to be proficient in multiple programming languages to deploy thin client or fat client Internet-based applications. Choosing the right set of languages has a dramatic impact on application performance and e-commerce. This course is designed to compare and contrast the various language tools for crafting Internet-based and Web-based applications. (3)

IE-712 Design of Cloud Networks and Services

This course examines Internet security concerning two key network design issues: information security and information privacy. Students learn and understand the technical tools to protect information from external compromise, internal and external threats, various network security technologies and protection systems, apply network design techniques capable of providing information security to local and wide-area networks, general information encryption techniques and protocols including symmetric and asymmetric cryptographic methodologies, one-way hashes and digital signatures, secure sockets layer and Internet Protocol Security (IPSEC), learn to evaluate and create corporate policies regarding privacy, the adoption of cloud computing and information network security. Prerequisite: IE-701 or department permission (3)

IE-713 Multimedia and Web Casting

The Internet and increased bandwidth management technologies has brought us a new venue to communicate with each other in either full duplex, half-duplex, or simplex modalities. Dot Com companies present us with radio stations, on demand streaming audio and video, and live casting of audio and video. To understand the integration, deployment, and optimization of these technologies, this course compares technical aspects, market positioning, and strengths, and weaknesses of various media products in the market. (3)

IE-715 Identifying and Integrating Component Collaboration Technologies

Software and hardware companies have utilized a component approach to product development in order to address the requirement that Internet and Intranet communications applications operate in a on-demand mode. This is the technical underpinning of the "any where, any time" mantra of the Internet. However, these components do not always integrate easily. This course identifies the various component technologies, standards, and issues with integration to provide on-demand communication capabilities. (3)

IE-717 Invention and the Use Intellectual Property

The Internet's ability to share ideas between millions of people instantaneously, and the ability of Internet users to improve upon those ideas and share them with everyone on the Internet instantaneously, has challenged intellectual property's status quo. This course examines the legal and regulatory limits of an e-business's ability to exploit intellectual value in the new paradigm. In addition, the latest changes to intellectual property law and regulation as a result of Internet commerce will be examined. (3)

IE-719 Capstone Course

The capstone course is in graduate seminar format. Students will integrate the prior course work and personal experiences into a major paper or a project. (3)

IE-730 SCADA Networks and Industrial Control Systems

Industrial Control Systems (ICS) have been in existence for decades in the United States. These systems are relatively unknown to the general public and were designed to control our critical infrastructure such as utilities (electricity, nuclear power, and water treatment plant). Until recently, these systems were connected to company networks by privately owned IT networks based on private line technology. Public utility companies have begun to connect ICS networks to public networks such as the Internet as they transition to TCP/IP based networks. This trend is accomplishing the much needed modernization of the nation's IT networks supporting the critical infrastructure and setting the groundwork for developing the federally mandated Smart Grid. The ICS network transition to public networks has many benefits and risks. SCADA software runs chemical plants and factories, transmission systems and electric power plants. Prerequisite: IE 701 (3)

MA-005 Basic Mathematics

Designed for students needing math skills for MA-110, MA-112 and MA-114. Topics include operations on signed numbers and fractions, products and factoring, exponents and roots, graphs, and solutions of first degree and quadratic equations. Credits from this course are not applicable toward a degree. (3-0-3)

MA-006 Basic Business Math

This course is designed for students needing math skills for MA-110. Topics include operations on signed numbers and fractions, percentages, products, compounding and quadratic equations. (3-0-3)

MA-110 Business Mathematics I

A general introduction to the mathematics used in the U.S. business. Focus is on developing the mathematical and critical thinking skills needed to solve math problems encountered in typical business situations. This course will help prepare the student for courses in Statistics and Accounting. Topics include 1) the essentials of business mathematics; and 2) accounting mathematics. Prerequisite: score on placement test. (3-0-3)

MA-111 Business Mathematics II

A continued introduction to the mathematics used in of U.S. business. Builds on the mathematical and critical thinking skills developed in MA 110 to address the topics of 1) retail mathematics and 2) introductory financial mathematics. This course will help prepare the student for courses in Marketing and Finance. (3-0-3)

MA-112 Intermediate Algebra

Designed for students needing mathematical skills and concepts for MA-114 and MA-216. In this course students are introduced to equations and inequalities and learn the language of algebra and related functions, including polynomial, rational, exponential and logarithmic functions. Other topics include solving equations, inequalities and systems of linear equations; performing operations with real numbers, complex numbers and functions; constructing and analyzing graphs of functions; and using mathematical modeling to solve application problems. Prerequisite: MA-005 or acceptance based on placement test scores. (3-0-3)

MA-114 Algebra and Trigonometry

Designed for students needing mathematical skills and concepts for MA-216; topics in this course are as follows. Algebra: basic operations on real and complex numbers, fractions, exponents and radicals. Determinates. Solution of linear, fractional, quadratic and system equations. Trigonometry: definition and identities, angular measurements, solving triangles, vectors, graphs and logarithms. Prerequisite: MA-112 or acceptance based on placement test score. (4-0-4)

MA-124 Discrete Mathematics

Logic sets and sequences; algorithms, divisibility and matrices; proof, induction and recursion; counting methods and probability; relations, closure and equivalence relations, graphs and trees; Boolean algebra. Prerequisite: MA-112, MA-114 or acceptance based on placement test score. Fall-evening only, Spring-daytime only. (3-0-3)

MA-128 Introduction to Statistics

Probability: definitions, theorems, permutations and combinations. Binomial, hypergeometric, Poisson and normal distributions. Sampling distribution and central limit theorem, estimation and hypothesis testing. Prerequisite:MA-110 or MA-114. Fall-daytime only; Spring-evening only. (3-0-3)

MA-230 Introduction to MATLAB

Intended for students with little or no experience with the Software. Introduction to MATLAB is a short course covering its basic operations and features. In addition, we will work through applications in engineering, physics and mathematics, provide a grounding for developing tools for your own projects. Topics include Import/export data, Create and manipulate variables, Program and run scripts (M-files) Use graphics tools to

display data. Use the built in help features. Perquisites: CT-115. MA-114 Corequisites: MA-261, PH-261/201 (3-0-3)

MA-261 Calculus I

Lines, circles, ellipses. Functions and limits, differentiation, power rule, higher-order derivatives, product, quotient and chain rules, implicit differentiation, applications. Integration: definite integrals; indeterminate forms; exponential, logarithmic, trigonometric and hyperbolic functions; differentiation and integration, graphing. Prerequisite: MA-114. Fall - daytime only; Spring - evening only. (4-0-4)

MA-262 Calculus II

Methods of integration: completing the square, substitution, partial fractions, integration by parts, trigonometric integrals, power series, parametric equations. Partial derivatives. Directional derivatives. Introduction to multiple integrals. Prerequisite: MA-261. Fall-evening only; spring-daytime only. (4-0-4)

MA-263 Calculus III

Multivariable and vector calculus. Integrals in two and three dimensional coordinate systems. Cylindrical and spherical coordinates. Vector functions and their derivatives. Gradients, divergence and curl. Stokes theorem, Green's theorem, Gausses theorem. Prerequisite: MA-262. (4-0-4)

MA-300 Mathematical Methods for Engineering

This course provides a basic understanding of MATLAB software for engineering, such as the basic matrix, matrix manipulation, college algebra and trigonometric concepts. In addition MATLAB techniques for solving problems by means of calculus and differential equations are introduced. Successful completion of this course will enable students to begin the study of more advanced topics such as the statics and dynamics classes taken by most engineering majors. Prerequisites: MA-261 and junior standing. (3-0-3)

MA-325 Mathematics of Cryptography

This course gives an introduction to the mathematics of cryptography. A survey of cryptography from Roman times up to today's current techniques. Cryptographic content for the course includes classical ciphers and their decryption (shift, affine and Vigenere ciphers), key exchange protocols (main example: Diffie-Hellman), public key ciphers (main example: RSA), block ciphers, modes of operation, hash functions and digital signatures. Mathematical formulations of security goals will be discussed as a method for determining weaknesses in designs. Prerequisites: MA-124 and CS-130 or CS-150. (3-0-3)

MA-340 Ordinary Differential Equations

Methods of solving first order equations with applications to mechanics and rate problems. Solutions of second order equations by undetermined coefficients and variations of parameters. Applications to circuits. Introduction to systems of equations and operational and numerical methods. Prerequisite: MA-262. (3-0-3)

MA-345 Probability and Statistics Engineers

Sets and methods of counting. Probability density functions, expected values and correlations. Binomial, Poisson, exponential and normal distribution. Central limit theorem and statistical estimation. Introduction to stochastic processes. Applications to noise and reliability. Prerequisite: MA-262. (3-0-3)

MA-355 Numerical Analysis

Number systems, floating-point arithmetic and error analysis. Taylor, interpolating and mini-max polynomials. Integration and differentiation. Methods of solving equations, systems of linear equations. Prerequisite: MA-262, and CT-115 or CS-130. (2-2-3)

MA-360 Laplace and Fourier Analysis

Definition of transform: Laplace transform of algebraic, exponential and trigonometric functions; basic theorems including shifting, initial and final-value theorems; unit-step, periodic and delta functions; methods of inverting transforms; solutions of differential equations by transform methods. Fourier series and coefficients; expansion of functions in Fourier series; complex Fourier coefficients; Parseval's Theorem; Fourier transform and its properties. Prerequisite: MA-340. (3-0-3)

MBA-501 Professional Writing Practicum

This course is designed to provide masters level students with the necessary writing skills to be successful writers in a professional environment. (3)

MBA-600 Fundamentals of Professional Management

A bridge course designed for students without a degree in business, this course addresses foundations of accounting, finance, statistics, and economics. Students are provided a broad overview of each of these topics for later application in the MBA program. This course is waived for students with an undergraduate degree in business management or business administration. (3)

MBA-601 Special Topics in Business Administration

Research into business administration subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. This course may be repeated with different projects. (1-4)

MBA-615 Financial Management

Provides an understanding of the business decision framework in the context of the economic environment in which decisions are made. Covers topics in capital investment policy, financing and capital structures, dividend policy, financial statement analysis, forecasting, and working capital management. It is preferable to complete MBA 620 before MBA 615. Prerequisite: MBA 600 or undergraduate degree in business. (3)

MBA-620 Managerial Accounting

The course examines the use of accounting data in corporate planning and control. The aim is student proficiency in the analysis and design of control systems in order to make decisions that allow management attention to be focused on long-term strategic issues. Covers internal and external auditing systems, financial reporting, and tax planning. Prerequisite: MBA-600 or undergraduate degree in business. (3)

MBA-625 Organizational Behavior

Analyzes the elements of organizational behavior. Theory and research in behavior science are explored. Topics include motivation, group dynamics, power, communication, ethics, conflict resolution, stress management, workforce diversity, and managing change. Cases are analyzed to develop skills in applying theories to common managerial problems. Students will apply ethical decision-making skills they learn in class to business matters involving conflicts of interest, work requirements, work conditions, and dealing with work-related problems. (3)

MBA-630 Marketing Process and Strategy

Explains key marketing concepts and their significance in domestic and international activities. Analyzes marketing problems and efforts regarding the organization's product and services, pricing activities, channel selection, and promotion strategies. Emphasis is on development and implementation of marketing plans and programs. (3)

MBA-635 Operations Management

This course provides an analysis of the role of operations management in a global environment. Focus is on the interaction of production and operations management with other functional systems in the organization. Incorporates quantitative and qualitative tools to support the decision-making process. (3)

MBA-640 Managerial Economics

Application of relevant economic theory to business problems. Examines general principles that can be applied to the business decision-making process in the presence of risk and uncertainty. Analysis of demand, costs, productivity, pricing policies, market structure, and government policies toward business within various marketing structures. Prerequisite: undergraduate degree in business (3)

MBA-646 Project Management

This course provides an overview of the theory and practice of managing a project in an organizational setting. Fundamentals concepts are covered to provide a solid understanding and foundation of managing each phase of the project life cycle, adhering to organizational and cost constraints, setting goals for stakeholders, and utilizing best practices to complete the project on time and within budget. (3)

MBA-647 Methods of IT Project Management

Methods of IT Project Management focuses on IT project management and is built around the Project Management Body of Knowledge (PMBOK). You will learn how IT projects differ from other kinds of projects and how the methods and techniques of project management must be modified/adapted for IT projects. In addition, you will gain an increased understanding of what managers do (or should be doing) and why managers ask you to do the things that they do. The course presents methods, tools, and techniques that can be used to effectively manage IT projects, both large and small. Prerequisite MBA-646 or equivalent (3)

MBA-648 Project Management/Competitive Advantage

Project Management takes decision-making and a business-oriented approach to the management of projects which is reinforced throughout the course with current examples of project management in action. Project management is central to operations within the context of a variety of successful organizations, whether publicly held, private or not-for-profit. Prerequisite: MBA-646 or equivalent (3)

MBA-650 Strategic Management

Examines the objectives, elements and framework of analysis for strategic management. Case studies will be used as the primary tool of learning and analysis. Working well with others, synthesizing information, applying sound business judgment, and communicating crisply are key skills for this class. This class should be taken as the last core class prior to the capstone project. (3)

MBA-657 Transformational Leadership and Innovation

Leadership is the process of influencing others to achieve results and this course examines leadership concepts applied to managing people, organizations and strategic processes. Leadership perspectives and philosophies of organization development, functions and systems are examined. Finally, students will examine how they

can provide innovative leadership based on both leadership theory and practice. Students will be expected to apply the various leadership skills and techniques to address challenges and opportunities they face through the term project. (3)

MBA-658 Legal, Political and Ethical

As the comprehensive business law course, areas of law critical to the success of managers and entrepreneurs are examined. Topics include contract issues, torts and product liability, business crimes, intellectual property, the law and structure of business organizations, employment, and bankruptcy. These issues are also explored in the context of rapidly changing technology and business practices. (3)

MBA-659 Leadership and Managing Human Capital

This course examines the concept of leading an increasingly diverse and global workforce. Emphasis is placed on creating a work environment adaptable to the new challenges of the 21st century. This course is based on the understanding that human capital is critical to creating competitive advantage. Course material is examined from a systems perspective. Theory and practice will be explored by comparing and contrasting effective use of leadership in both the private and public sectors.(3)

MBA-660 Special Projects in MBA

Research into business administration and related subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. This course may be repeated with different projects to a maximum of 9 credits. (3 credits)

BA-665 Entrepreneurship

Course focuses on all aspects of starting a new business. Emphasis is on the critical role of recognizing and creating opportunities. Topics include attributes of entrepreneurs and entrepreneurial careers, evaluating opportunities, writing business plans, and financing the venture.(3)

MBA-700 Capstone Project

Students complete a research project in the field of major concentration. The research is supervised by a faculty member and must be defended by the student in an oral examination. Internships under the supervision of an academic advisor are an option. This course is to be taken last or next to last as the student applies accumulated knowledge of both core and concentration classes to this effort. (3)

MBA-701 Federal Acquisitions and Contracting

This course covers the fundamentals of Federal acquisitions and contracting and will provide a comprehensive understanding of the acquisition environment. Students will develop professional skills for making business decisions and advising other acquisition team members to successfully meet customers' needs. Participation in small group simulation exercises will prepare students to provide contracting support within the overarching business relationships of government and industry. Prerequisite: MBA-646 or equivalent. (3)

MBA-702 Mergers and Acquisitions

This course surveys the drivers of success in mergers and acquisitions (M & A) and develops your skills in the design and evaluation of these transactions. The M & A transactions will cover the foundation for a wide range of mergers and acquisition fields including corporate development, investment banking, consulting and advising senior management. (3)

MBA-703 Software Acquisitions

This course covers the acquisition of open systems and commercial off-the-shelf (COTS) products, an increasingly vital element of corporate and government software development. Properly managed software acquisition offers potential for significant time and cost savings over a system's lifetime. The transition from proprietary, custom-built systems to systems based on standards and commercial products is not easy, however. Managers and their staff must understand the risks and opportunities associated with this acquisition approach.(3)

NT-100 Computer Architecture and Construction

Basic introduction to the design and construction of a current model PC including operating systems and some diagnostic software. Students build, configure, test and troubleshoot PCs in the laboratory. This material can be used as a basis for studying for the CompTIA A+ exam. (1-4-3)

NT-150 Computer Networking

This course is a continuation of NT-100 with major emphasis on local network equipment, network software and addressing schemes. Students build, configure, test and troubleshoot a network in the laboratory. Routers and switches are included. This material can be used as a basis for studying for the CompTIA Network + exam. (1-4-3)

NT-250 Microsoft Infrastructure and Design

This course will address the design processes for Microsoft infrastructure technologies and services. These technologies include Windows server, workstation, and active directory to name a few. Students will also implement VPN's, firewalls, IDS's, PKI, and AAA servers to protect the infrastructure will be discussed. Students will be challenged in a lab environment with unique infrastructure technology scenarios to design and implement to both meet customer requirements and satisfy security policies to protect sensitive customer data. Prerequisite: NT 100, 150 or Permission (4)

NT-350 Virtualized Networks and Data Centers

Cloud computing services allow users to lease computing resources from large scale data centers operated by service providers. Using cloud services, users can deploy a wide variety of applications dynamically and on-demand. Most cloud service providers use machine virtualization to provide flexible and cost-effective resource sharing. Organizations must take the proper steps to transition to virtualized services by first consolidating their server farms, then virtualize infrastructure such as servers and work stations and databases. This course will use a intensive hands on approach to teach students to plan, design and build such a virtualized infrastructure to meet the needs of the organization on a cost effective, efficient and secure manner. Prerequisite: NT 100, 150, 250 or Permission (4)

P-301 Fiber-Optic Communications

Lightwave propagation in fiber optics, including modal conditions, numerical aperture, attenuation and signal distortion in step-index and graded-index fibers. Connectors, splices and analysis of coupling losses. Operating principles and characteristics of optical sources and detectors. Transmitter and receiver circuits for analog and digital communication. Design consideration for practical optical communication links using power budget and rise-time analysis. Discussion and comparison of latest multiplexing and coupling techniques used in optical networks. Contains labs. Prerequisites: EL-261 and MA-261. (2-2-3)

PH-201 General Physics I

Non calculus-based physics intended for credit in engineering technology courses. Use PH-261 for electrical, computer and software engineering courses. Mechanics: units, conversion factors: vector diagrams, translational equilibrium, friction, torque and rotational equilibrium: uniformly accelerated motion, projectiles: Newton's Law, work energy and power: kinetic and potential energy, conservation of energy: impulse and momentum. Heat: temperature scales, thermal properties of matter, heat and temperature change, heat and change of phase, physics of heat transfer; applications. Prerequisite: MA-114. Fall-evening only; Spring-daytime only. (2-2-3)

PH-202 General Physics II

Non calculus-based physics intended for credit in engineering technology courses. Use PH-262 for electrical, computer and software engineering courses. Light and sound: wave motion, nature of light, reflection and mirrors, refraction, prisms, dispersion lenses; simple harmonic motion; sound transmission, resonance, interference. Doppler Effect. Electricity and magnetism: Static electricity, electric fields, magnetic fields, electric potential, capacitance; electricity in motion; magnetic induction; electromagnetic relations. Alternating currents. Prerequisite: PH-201. Fall - daytime only; spring - evening only. (2-2-3)

PH-253 Energy and the Environment

This course covers fundamentals of energy generation (conversion), current diversity of energy resources from fossil fuels to renewable and alternative sources, and environmental impact of the generation and use of energy. Topics include the availability, economics and environmental consequences of energy generation, distribution and consumption from oil, coal, gas, hydrogen, nuclear, wind, solar, geothermal, hydro, biomass and other alternative sources currently under development and study by the scientific and engineering communities. Efficient use of energy in the domestic, transportation and industrial sectors will be discussed. This course may be used as a general, technical, science or engineering elective. Prerequisite: PH-201 (3-0-3)

PH-261 Engineering Physics I

Calculus-based physics. Displacement, velocity and acceleration, equations of motion, Newton's laws of motion and their applications, gravitation, work and energy, impulse and momentum, conservation laws, rotational motion, rotational dynamics, equilibrium, elasticity, periodic motion. Prerequisite: MA-261. Corequisite: MA-262. Fall-evening only; spring-daytime only. (3-2-4)

PH-262 Engineering Physics II

Calculus-based physics. A continuation of PH-261. Topics include wave motion, vibration and sound, electricity and magnetism, Coulomb's Law, electrical fields, induction. Prerequisite: PH-261. Fall-daytime only; spring-evening only. (3-2-4)

PH-263 Engineering Physics III

Calculus based. Introduction to light, lens and diffraction. Photon and their interaction with matter. Wave-particle duality. Basic quantum discoveries leading the Bohr atom and atomic spectra. Interaction of electrons and photons with matter with special emphasis on the design of detectors and electronic devices that use quantum effects. Prerequisite PH-262. (3-2-4)

PH-400 Einstein's Theory of Relativity

Introduction to Einstein's Special and General Theory of Relativity. Topics covered: the physics of Lorentz contraction, time dilation, the "twin paradox" and energy, momentum in Special Relativity; mass in Relativity, Schwarzschild metric,

Black Holes and Cosmology, behavior of light and applications to Global Positioning Systems. Prerequisites: PH-263 and MA-340 or permission of instructor. (3-0-3)

PH-463 Quantum Physics
Fundamentals of quantum physics: wave – particle duality, the Heisenberg uncertainty principle. Schrodinger's wave equation and solutions. WKB approximation, and time-dependent perturbation theory methods. Interaction of matter with radiation. Application to atomic and molecular spectra. Lasers and quantum computing. Prerequisites: MA-262 Calculus II and PH-262 Engineering Physics II, or permission of instructor. (3-0-3)

PHL-813 Professional Ethics
This course examines the role of ethics in society. Cultural diversity, legal behaviors and the impact of moral behaviors on private and public organizations are presented in case studies. The various roles and impacts of unethical behaviors by system developers, users, managers, executives and consultants will be analyzed and the positive and negative impacts discussed as they pertain to the overall trustworthiness. (3) course is designed to provide doctoral learners the necessary writing skills to be successful at the doctoral level. (3)

PHL-900 Management Theory in a Global Economy
This course provides an overview of seminal management theories and their relevance, applicability, and/or divergence from current business practice. The focus of the course is on understanding the application of management theories in the context of organizational sustainability in a global economy. (3)

PHL-880 Special Topics in Management
This course provides students the opportunity to examine in-depth issues relevant to Management and Decision Sciences. It is expected that students will produce a publishable paper.(3)

PHL-990 Management Theory in a Global Economy
This course provides an overview of seminal management theories and their relevance his course is designed to provide doctoral learners the necessary writing skills to be successful at the doctoral level. (3)

RSC-601 Professional Writing Practicum
This course is designed to provide doctoral learners the necessary writing skills to be successful at the doctoral level. (3)

RSC-802 Fundamentals of Doctoral Learning
Doctoral programs educate students for highly specialized careers in academe or practice. Students of doctoral level programs are taught the ability to create knowledge through original research in their areas of specialization. This course will orient new doctoral students to learning at the doctoral level and prepare them for the entire program of study. Students will each develop a Doctoral Learning Contract (DLC) that will serve as guides through graduation. (6)

RSC-805 IA Standards and Frameworks
This course covers Information Assurance (IA) umbrella standards and frameworks for cyber security and the broad areas of knowledge considered important for practicing professionals in information assurance. Students will acquire the means to identify a body of core knowledge and skills that all programs should contain as well as the ability to work with models of scope and assurance standards practices. With this foundation, the course provides students with rigorous methods for eliciting information assurance requirements using identification, characterization, categorization and modeling. Prerequisite: RSC-801or RSC-802. (3)

RSC-810 Professional Research Theory and Practice I
Students will examine the research process in the context of quantitative and qualitative methods. Students will develop a purpose statement, problem statement, and research question. Prerequisite: IAE-830. (3)

RSC-811 Professional Research Theory and Practice
This course is designed to provide students an overview of a broad range of qualitative and quantitative methodologies applicable to doctoral level research. The course will examine the research process, including problem statements, developing dissertation research questions, conducting a literature review, and ethical implications in research. Students begin examining topics for Chapter 1 of the dissertation. Prerequisite: DSM-910 (3)

RSC-812 Professional Research Theory and Practice II
This course takes the foundational research designs established in IAE-860 and provides students with practical applications of research design in chapters one and three of the dissertation. Students will generate significant portions of the writing in these areas.. Prerequisite: RSC-810 and IAE-860 (3)

RSC-813 Professional Ethics and Leadership
This course examines the role of ethics. Cultural diversity, legal behaviors and the impacts of moral behaviors on business, corporations and agencies are presented in case studies. The various roles and impacts of unethical behaviors by system users, managers, executives and consultants will be analyzed and the positive and negative impacts discussed as they pertain to the overall trustworthiness. IRB requirements as it relates to research and human subjects will be examined in this course. Prerequisite: RSC-801 or RSC-802. (3)

RSC-815 Problem Solving and Decision Making Using Quantitative Methods
The objective of this course is to provide students with the necessary knowledge to design and implement quantitative data analysis as part of scholarly research. The focus is on crafting research questions, hypotheses and proper data collection schemes. Students will explore a range of data analysis techniques useful for testing hypothesis and answering research questions. Research topics include: survey design, correlational design, casual-comparative design and experimental designs. Statistics topics include: types of data, parametric versus non-parametric classes of tests, descriptive statistics and inferential statistics. Prior experience with statistics is not required. (3)

RSC-820 Situational Awareness, Analysis and Action(Residency) Students will generate a purpose statement, problem statement, and research question within their selected dissertation topic area. Prerequisite: RSC-810. (3)

RSC-821 Contemporary Research in Management
(Residency)Specialized contemporary topics in management, managing information systems, and decision analytics are presented for doctoral students. Qualifying exam will be administered at this residency. Prerequisite: RSC-811 (3)

RSC-825 Applied Research in IA
Building on RSC-810 and RSC-820, students will engage in formal research in order to develop the background of their topic problem statement and to locate seminal research for the topic. Prerequisite: RSC-820. (3)

SE-301 Software Engineering
Introduction to software design. Software performance, modularity, portability and reliability. Students apply engineering principles to create software solutions to specified problems. Software testing and CASE tools introduced. Emphasis on UML and object-oriented code. Prerequisite: CS-220. Offered during fall semester only. (2-2-3)

SE-321 Human Computer Interaction
Students learn user-centered design of computer systems with the goal of high usability. Emphasis is on designing systems that are efficient, easy-to-use, enjoyable and effective. Explores the selection of interaction style, hardware, and the use of color, font, text and images. Explores design implications due to user characteristics such as age, dexterity, experience and disabilities. Students learn requirements gathering, prototype building and user testing. A group project is assigned. Prerequisite:Engineering degrees CS-130 or CS-150; Business degrees BUS-250 or CS-220. Offered during Spring semester only. (3-0-3)

SE-351 Software Testing
Covers the techniques and concepts required for software testing. Topics covered include software testing at the unit, module, subsystem and system levels; coverage criteria, manual and automated techniques for test validation and data generation; formal testing processes and standards (with an emphasis on CMMI); rational tools suite; inspections; black box vs. white box testing; functional testing; and testability analysis. Prerequisites: SE-301 and CS-220 or permission of the instructor. (2-2-3)

SE-458 Senior Design Project
Student proposes, designs, builds, and tests a working software project. Students write a report according to specifications and deliver an oral presentation for review. For SE, WD, CS, CE and CET programs. CE and CET students should see advisor before registering. Prerequisites are EN-408 and senior standing. (3-0-3)

SM-513 Systems Management and Organization
Basic concepts applied to managing large-scale systems. Perspectives and philosophies of organization, functions and processes of systems management and organizational leadership. (3)

SM-517 Psychological Factors in Systems Management
Human characteristics and their bearing on systems management critical review of theory and research on personality, motivation, values, stress, leadership skills and power bases. (3)

SM-518 Principles of Systems
Systems theories, methodologies, thinking and practice; hard and soft systems approaches; multidisciplinary approaches to organizational problem solving, feedback loops and system change. Prerequisite: SM-513. (3)

SM-525 Systems for Managers
Develop probabilistic and statistical concepts, methods, and models through the use of real-life data from business. Stresses the role that statistics plays in the managerial decision making process. Use of statistical software package is emphasized. (3)

SM-563 Managing Information Systems
This course provides the student with an understanding of principles, practices, methodologies, and terminology used in planning, designing, implementing, operating, and managing informa-

tion systems in government and industry. The overall approach is to examine the technology and roles of information systems within the organization, concentrating on how information systems are designed and how they operate. Knowledge of computer concepts will be provided to students new to this field. Prerequisite: SM-513. (3)

SM-567 Business Data Communications and Networking

This course is designed to develop skills and proficiency in information systems which use telecommunications facilities, computer networks, data communications, distributed processing, interactive systems, and the planning, design and analysis of telecommunications-based information systems for systems management. This course was formerly entitled "Telecommunications and Computer Networks." Prerequisite: SM-563. (3)

SM-569 Decision Support and Expert Systems

This course helps the student understand techniques, terminology, principles, concepts and methodologies for using computers in decision making in business, aerospace, and government. The overall approach examines the nature and process of decision making, using a framework of Decision Support Systems (DSS) and Expert Systems, and explores specific computer applications in a variety of management decision situations applying learned techniques in a project. Prerequisite: SM-567. (3)

SM-570 Business Analytics

Introduces students to the key business, computational, and data competencies needed by business analysts to fulfill the information needs of decision makers at all levels of an organization. Business analytics (BA) refers to the skills, technologies, applications and practices for continuous iterative exploration and investigation of past business performance to gain insight and drive business planning. Analytics can also be used as input for human decisions or it may drive fully automated decision support (ADS) tools. The course will provide usable information for the students on how "big data" can be used to help decision makers improve organizational competitiveness. BA makes extensive use of large data sets, statistical and quantitative analysis, explanatory and predictive modeling, and fact-based management to drive decision-making. Students also gain experience with different software tools used for data analysis and reporting. In the course students will focus on developing new insights and understanding of business performance based on data and statistical methods. Course deliverables will include in-depth case analyses, exams, and a course project and presentation to the class. Prerequisite: SM-569. (3)

SM-587 Law and Regulation of E-Commerce

The course is an examination of the complex political, legal and regulatory compliance issues influencing electronic commerce. This course will attempt to make sense of the status quo ante of electronic law and regulation to enable students to conduct business online. The future landscape, based upon developments in technology, applications, proposed legislation and administrative rule making, is discussed. (3)

SM-600 Special Topics in Systems Management

Research into systems management subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. This course may be repeated with different projects. (1-4)

SM-615 Applied Statistics and Visualization

Introduces multivariate regression and random forests for modeling data. Addresses data access, variable selection and model diagnostics. Introduces foundations for visual thinking. Reviews common statistical graphics such as dot plots, box plots, q-q plots. Addresses more advanced methods such as scatterplot matrices enhanced by smoothed or density contours, and search tools for finding graphics with suggestive patterns. Course will introduce R software for analysis. A final project will involve visualization of a real data set. Prerequisite: Undergraduate statistics.

SM-620 Big Data Warehousing and Analytic Systems

This course will equip the student with the necessary skills to solve complex problems and design solutions using Big Data. The student will be able to gain an understanding of how to design databases to manage large volumes of data from multiple sources, and how that data can be analyzed and translated into meaningful results. The student will be introduced to the field of Analytics, gain an understanding of Enterprise Data Warehousing models, be introduced to Data Mining techniques and tools used for mining the data warehouse, and build specific Data Marts. The student will be introduced to predictive analysis, and will be expected to develop models to extract data, perform trend analysis, establish patterns, and make projections. Prerequisites: Ability to use Structured Query Language with a basic relational database system; ability to read pseudocode, and understand basic data structures like arrays; and, an understanding of algebra and basic probability and statistics would be helpful, though not required.

SP-358 Internship Program

This is an elective course intended to provide students an alternate educational experience in industry and government that complements and strengthens their classroom education. Internship positions must be related to the students major and be creative and analytical in nature, for a minimum of eight weeks. The intern is under the supervision or mentorship of an experienced professional. Prerequisites: junior or senior status. Cumulative GPA 2.8+ and 3.0+ in major. Approval by the dean of academics required. (3-0-3)

SP-359 Internship Program II

This is the second of two elective courses intended to provide students an alternate educational experience in industry and government that complements and strengthens their classroom education. Prerequisites: junior or senior status. Cumulative GPA 2.8+ and 3.0+ in major. Approval by the dean of academics required. (3-0-3)

SP-400 Special Topics in Business and Technology

Students are provided the opportunity to examine topics of special interest in the field of business, management and technology. The student works in a guided study format with a mentor. Permission is required from the instructor and the dean of academics. This course may be repeated with different projects. (3-0-3)

SS-171 Introduction to Psychology

This course is a fundamental study of human behavior exploring such topics as learning and cognition, memory, intelligence, motivation and emotion, consciousness, personality, and abnormal behavior. A discussion of the scientific character of psychology and the research methodology employed in the discipline will be included. Perquisite or Corequisite: EN-001 or EN-101. (3-0-3)

SS-175 Introduction to Sociology

A survey of the basic concepts and principles of sociology, culture, human nature, personality and the self, socialization, society, group behavior, norms and deviance, and institutions. The topic of social problems will be addressed by an in-depth examination of a contemporary issue. A primary text and newspapers, magazines and journals will be used for this unit in addition to the textbook. Prerequisite: EN-101. (3-0-3)

SS-181 Human Development

This course provides a comprehensive and integrated review of human development from a psychological perspective. The lifespan model provides a coherent time-line approach for students to study, observe, and reflect on personal life developments as well as how relationships with individuals, families, and communities are integral to our development as humans. Perquisite or Corequisite: EN-101. (3-0-3)

SS-272 Group Dynamics

Focuses on interpersonal relations and skills development; cross-cultural relations and communication; organizational climate and culture and their relationship to and impact on individuals and groups; personality traits and team building; and characteristics and functions of groups in high-tech organizations both in the United States and abroad. Corequisite: EN-102. (3-0-3)

SS-275 History of Modern Culture

This course offers students a review and survey of world history and how it affected culture from 1946 to present through the use of the Internet. Students will learn the important historical events during this time period and how they impacted society, culture and politics. Students will learn major historical events, their geographical location and their world impact. Students will select a subject and throughout the semester be able to discuss their subject as it relates to the time period covered. Students will be required to do oral and written presentations covering 1946 to modern times. Corequisite: EN-101. (3-0-3)

SS-301 History of Technology

This is a survey course designed to give students an overall view of the development and effect of technology on American economic trends, social trends and cultural traditions through critical analysis. The focus is on the early twentieth century to the present day. Prerequisite: EN-102. (3-0-3)

SS-351 Ethics

This course is designed to help students improve their ability to make ethical decisions. This is done by providing a framework that enables the student to identify, analyze, and resolve ethical issues that arise when making decisions. Case analysis is a primary tool of this course. Prerequisite: EN-102. (3-0-3)

SS-400 Social Science: Special Topics

Research into social sciences. Student primarily works in a guided study format with a mentor. Permission required from the instructor and the dean of academics. (3)

TC-110 Introduction to Telecommunications

Telecommunications defined and its effects on our daily lives. Structure of the telecommunications industry. Brief history. Basic terminology. Type of analog and digital communications systems. Data communications and networking. Introduction to local area networks, and wide area networks.

Microwave and cellular systems. Satellite systems. Internet and its structure, World Wide Web, website technology and terminology. (2-2-3)

TC-312 Voice Over IP

This course offers students a hands-on approach for learning how Voice Over IP works, how it's planned and how it's implemented. The students will be expected to complete a series of labs on equipment and simulators to build shared data and voice networks. Students will work with specialized high performance networking equipment such as phones and switches that primarily support three functions. Students will configure VLAN networks to support the VOIP infrastructure. The commercial software such as Cisco Communication Manager Express (CME) and Cisco Unified Communication Manager (CUCM) will be used. Prerequisite: CT-240 or equivalent or permission of instructor. (2-2-3)

TC-319 Network Infrastructure Security

This course focuses on how to secure network infrastructures through hands on labs, since many attacks are geared to degrade, compromise and even disable network infrastructures. Some of the tasks covered will be the securing of network switches and routers, their configurations and secure deployment, encryption of traffic and deployment of VPN. In addition, the labs will help students be competent in configuring firewalls such as ASA routers. Prerequisite CT-240. (1-3-3)

TC-359 Networking Modeling and Design

A continuation of TC-309 where students are expected to design model, simulate and analyze networks to meet real-world situations. Networks are designed and tested for traffic handling capabilities and robustness. Alternate network solutions are proposed and tested. Virtual simulation software is used throughout course. Prerequisites: CT-240 and MA-128 (1-3-3)

TC-400 Special Projects in Telecommunications

Guided study. This course is a project course in which students research a problem in the field of telecommunications under the guidance of a professor or member of the academic staff. Students are required to produce a final written and oral presentation of their effort. Prerequisite: Permission of instructor. (0-6-3)

TC-401 Advanced Topics in Telecommunications

Layered protocol models. Ethernet, TCP/IP with mathematical throughput analysis. SMTP, POP, HTTP analyzed using Ethereal. Number theory, encryption and authentication. The RSA algorithm. Routing algorithms (RIP, OSPF). Optimal capacity assignment. Laboratory exercises performed using actual constructed networks (Windows/Linux) and virtual networks (in VMWare). Prerequisites: CT-152 and MA-128 or equivalent. (2-2-3)

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Calendar

Fall Semester 2015

Undergraduate Classes

Semester-long Classes

Aug. 10-14 Registration for part-time students
Aug. 12-14 Orientation, registration and residence hall check-in for new students
Aug. 14 Final day of registration
December graduates notify Office of Registration and Records
Aug. 15 Residence hall check-in for returning students
Aug. 17 Classes begin
Last day for 100% refund
First tuition installment due
Library opens
Cooperative education work period begins
Aug. 24 Electronics, physics and chemistry labs open
Learning Center opens
Aug. 31 Last day for 75% refund
Last day to add a course
Sept. 7 Labor Day – university closed
Sept. 8 Last day for 50% refund
Sept. 14 Last day for 25% refund
Last day to drop without a W
Second tuition installments due
Sept. 14-21 Financial Aid Disbursement Week/ Pell Census
Sept. 22 Career Day - no classes
Faculty Colloquium, Noon -1 p.m.
Oct. 9 Final tuition installment due
Oct. 26 Last day to drop course with W or audit course
Registration for spring semester begins for continuing students
Nov. 25 Classes canceled – university closes at 5 p.m.
Nov. 26-29 Thanksgiving recess – university closed
Dec. 4 Classes end
Electronics, physics and chemistry labs open
Learning Center closes
All library materials are due
Last day for cooperative education work
Last day to withdraw
Dec. 7-11 Final examinations
Dec. 11 Library closes
Residence halls close at 5 p.m.
Dec. 16 University closes at 5 p.m.
Dec. 17-Jan. 3
Winter recess – university closed

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Graduate Classes

Semester-long Classes

Aug. 21 Final day of registration
Aug. 24 Classes begin
Last day for 100% refund
First 50% tuition installment due
Sept. 7 Labor Day – university closed (Online classes will meet asynchronously.)
Sept. 8 Last day for 75% refund
Last day to add a course
Sept. 14 Last day for 50% refund
Sept. 21 Last day for 25% refund
Final 50% tuition installment due
Oct. 28 Registration for spring semester begins
Nov. 2 Last day to drop or audit course
Nov. 25 University closes at 5 p.m. (Online classes will meet asynchronously.)
Nov. 26-29 Thanksgiving – university closed (Online classes will meet asynchronously.)
Dec. 4 Last day to withdraw
Dec. 11 Classes end
Dec. 16 University closes at 5 p.m.Dec.
Dec. 17-Jan. 3
Winter recess – university closed

Fall – Term I

Aug. 21 Final day of registration
Aug. 24 Classes begin
Last day for 100% refund
First 50% tuition installment due
Aug. 31 Last day for 75% refund
Last day to add a course
Sept. 7 Labor Day – university closed (Online classes will meet asynchronously.)
Sept. 8 Last day for 50% refund
Sept. 14 Last day for 25% refund
Last day to drop or audit course
Sept. 2` Final 50% tuition installment due
Oct. 9 Last day to withdraw
Oct. 16 Classes end

Fall – Term II

Oct. 16 Final day of registration
Oct. 19 Classes begin
Last day for 100% refund
First 50% tuition installment due
Oct. 26 Last day for 75% refund
Last day to add a course
Oct. 28 Registration for spring semester begins
Nov. 2 Last day for 50% refund
Nov. 9 Last day for 25% refund
Last day to drop or audit course
Nov. 16 Final 50% tuition installment due
Nov. 25 University closes at 5 p.m. (Online classes will meet asynchronously.)
Nov. 26-29 Thanksgiving – university closed (Online classes will meet asynchronously.)
Dec. 4 Last day to withdraw
Dec. 11 Classes end
Dec. 16 University closes at 5 p.m.
Dec. 17-Jan. 3
Winter recess – university closed

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Spring Semester 2016

Undergraduate Classes

Semester-long Classes

Jan. 4-8	Registration for part-time students
Jan. 4	University opens
Jan. 7	Residence hall check-in for new students
Jan. 8	Final day of registration Graduation applications due for Class of 2016 Orientation and registration for new students
Jan. 9	Residence hall check-in for returning students
Jan. 11	Classes begin Last day for 100% refund First tuition installments due Library opens Co-op work period begins
Jan. 18	Martin Luther King Jr. Day – university closed
Jan. 19	Electronics, physics and chemistry labs open Learning Center opens
Jan. 25	Last day for 75% refund Last day to add a course
Feb. 1	Last day for 50% refund
Feb. 8	Last day for 25% refund Last day to drop course without W Second tuition installments due
Feb. 8-15	Financial Aid Disbursement Week/ Pell Census
Mar. 4	Final tuition installment due
Mar. 14-18	Spring recess (service offices open)
Mar. 21	Classes resume Last day to drop course with W or audit course
Apr. 6	Registration for summer semester begins for continuing students
Apr. 13	Pre-registration for fall semester begins for continuing students
May 2	Classes end Last day to withdraw Electronics, physics and chemistry labs close Learning Center closes All library materials are due Last day for cooperative education work
May 3-9	Final examinations
May 9	Library closes
May 10	Residence halls close at 7 p.m.
May 14	Commencement

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Graduate Classes

Semester-long Classes

Jan. 4	University opens Final day of registration
Jan. 5	Classes begin Last day for 100% refund First 50% tuition installment due Graduation applications due for Class of 2016
Jan. 18	Martin Luther King Day -- university closed. (Online courses will meet asynchronously.)
Jan. 20	Last day for 75% refund Last day to add a course
Jan. 26	Last day for 50% refund
Feb. 2	Last day for 25% refund Final 50% tuition installment due
Mar. 7	Registration for summer session begins
Mar. 15	Last day to drop or audit course
Alpr 11	Pre-registration for fall semester begins
Apr 18	Last day to withdraw
Apr 25	Classes end
May 14	Commencement

Spring -- Term 1

Jan. 4	University opens Final day of registration
Jan. 5	Classes begin Last day for 100% refund First 50% tuition installment due Graduation applications due for Class of 2016
Jan. 12	Last day for 75% refund Last day to add a course
Jan. 18	Martin Luther King Day -- university closed. (Online courses will meet asynchronously.)
Jan. 19	Last day for 50% refund
Jan. 26	Last day for 25% refund Last day to drop or audit course
Feb. 2	Final 50% tuition installment due
Feb. 22	Last day to withdraw
Feb. 29	Classes end

Spring -- Term II

Feb. 29	Final day of registration
Mar. 1	Classes begin Last day for 100% refund First 50% tuition installment due
Mar. 7	Registration for summer session begins
Mar. 8	Last day for 75% refund Last day to add a course
Mar. 15	Last day for 50% refund
Mar. 22	Last day for 25% refund Last day to drop or audit course
Mar. 29	Final 50% tuition installment due
Apr. 11	Pre-registration for fall semester begins
Apr. 18	Last day to withdraw
Apr. 25	Classes end
May 14	Commencement

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Summer Session 2016

Undergraduate Classes

Session-long Classes

May 13 Final day of registration
August graduates notify Office of Registration and Records
Cooperative education work period begins

May 16 Classes begin
Last day for 100% refund for 8- and 11-week courses
First tuition installments due
Library opens

May 23 Last day for 75% refund for 8-week courses
Electronics, physics and chemistry labs open
Last day to add a course

May 30 Memorial Day – university closed

May 31 Second tuition installments due for 8-week courses
Last day for 50% refund for 8-week courses
Last day for 75% refund for 11-week courses

June 6 Last day for 25% refund for 8-week courses
Last day to drop 8-week course without W
Last day for 50% refund for 11-week courses

June 7 Last day to drop 8-week course with W or audit 8-week course

June 13 Last day for 25% refund for 11-week courses
Last day to drop 11-week course without W
Second tuition installments due for 11-week courses

June 13-20 Financial Aid Disbursement Week/ Pell Census

June 27 Final tuition installment due for 8-week courses

July 1 Last day to withdraw from 8-week courses
Last day to drop 11-week course with W or audit 11-week course
Classes end for 8-week courses

July 4 Independence Day – university closed

July 5-11 Final exams for 8-week courses

July 11 Final tuition installment due for 11-week courses

July 26 Classes end for 11-week courses
Electronics, physics and chemistry labs close
All library materials are due
Last day to withdraw from 11-week courses

July 27-Aug. 2 Final exams for 11-week courses

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Graduate Classes

Semester-long Classes

Apr. 26 Final day of registration

Apr. 27 Classes begin
Last day for 100% refund
First 50% tuition installment due

May 12 Last day for 75% refund
Last day to add a course

May 14 Commencement

May 19 Last day for 50% refund

May 26 Last day for 25% refund
Final 50% tuition installment due

May 30 Memorial Day – university closed (Online classes will meet asynchronously.)

July 4 Independence Day – university closed (Online classes will meet asynchronously.)

July 6 Last day to drop or audit course

Aug. 7 Last day to withdraw

Aug. 16 Classes end

Summer – Term I

Apr. 26 Final day of registration

Apr. 27 Classes begin
Last day for 100% refund
First 50% tuition installment due

May 5 Last day for 75% refund
Last day to add a course

May 12 Last day for 50% refund

May 14 Commencement

May 19 Last day for 25% refund
Last day to drop or audit course

May 30 Memorial Day – university closed (Online classes will meet asynchronously.)

May 26 Final 50% tuition installment due

June 15 Last day to withdraw

June 21 Classes end

Summer – Term II

June 21 Final day of registration

June 22 Classes begin
Last day for 100% refund
First 50% tuition installment due

July 1 Last day for 75% refund
Last day to add a course

July 4 Independence Day – university closed (Online classes will meet asynchronously.)

July 8 Last day for 50% refund

July 15 Last day for 25% refund
Last day to drop or audit course

July 22 Final 50% tuition installment due

Aug. 10 Last day to withdraw

Aug. 16 Classes end

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Fall Semester 2016

Undergraduate Classes

Semester-long Classes

Aug. 15-19 Registration for part-time students
Aug. 17-19 Orientation, registration and residence hall check-in for new students
Aug. 19 Final day of registration
December graduates notify Office of Registration and Records
Aug. 20 Residence hall check-in for returning students
Aug. 22 Classes begin
Last day for 100% refund
First tuition installment due
Library opens
Cooperative education work period begins
Aug. 29 Electronics, physics and chemistry labs open
Learning Center opens
Sept. 5 Labor Day – university closed
Sept. 6 Last day for 75% refund
Last day to add a course
Sept. 12 Last day for 50% refund
Sept. 19 Last day for 25% refund
Last day to drop without a W
Second tuition installments due
Sept. 19-26 Financial Aid Disbursement Week/ Pell Census
Sept. 27 Career Day - no classes
Faculty Colloquium, Noon -1 p.m.
Oct. 14 Final tuition installment due
Oct. 31 Last day to drop course with W or change to audit
Registration for spring semester begins for continuing students
Nov. 23 Classes canceled – university closes at 5 p.m.
Nov. 24-27 Thanksgiving recess – university closed
Dec. 9 Classes end
Electronics, physics and chemistry labs open
Learning Center closes
All library materials are due
Last day for cooperative education work
Last day to withdraw
Dec. 12-16 Final examinations
Dec. 16 Library closes
Residence halls close at 5 p.m.
Dec. 21 University closes at 5 p.m.
Dec. 22-Jan. 2
Winter recess – university closed

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Graduate Classes

Semester-long Classes

Aug. 26 Final day of registration
Aug. 29 Classes begin
Last day for 100% refund
First 50% tuition installment due
Sept. 5 Labor Day – university closed
(Online classes will meet asynchronously.)
Sept. 12 Last day for 75% refund
Last day to add a course
Sept. 19 Last day for 50% refund
Sept. 26 Last day for 25% refund
Final 50% tuition installment due
Nov 2 Registration for spring semester begins
Nov. 7 Last day to drop or audit course
Nov. 23 University closes at 5 p.m.
(Online classes will meet asynchronously.)
Nov. 24-27 Thanksgiving – university closed
(Online classes will meet asynchronously.)
Dec. 9 Last day to withdraw
Dec. 16 Classes end
Dec. 22 University closes at 5 p.m.
Dec. 22-Jan. 2
Winter recess – university closed

Fall – Term I

Aug. 26 Final day of registration
Aug. 29 Classes begin
Last day for 100% refund
First 50% tuition installment due
Sep. 5 Labor Day – college closed
(Online classes will meet asynchronously.)
Sep. 6 Last day for 75% refund
Last day to add a course
Sept. 12 Last day for 50% refund
Sept. 19 Last day for 25% refund
Sept. 20 Last day to drop or audit course
Sept. 26 Final 50% tuition installment due
Oct. 14 Last day to withdraw
Oct. 21 Classes end

Fall – Term II

Oct. 21 Final day of registration
Oct. 24 Classes begin
Last day for 100% refund
First 50% tuition installment due
Oct. 31 Last day for 75% refund
Last day to add a course
Nov. 2 Registration for spring semester begins
Nov. 7 Last day for 50% refund
Nov. 14 Last day for 25% refund
Last day to drop or audit course
Nov. 23 Final 50% tuition installment due
University closes at 5 p.m.
(Online classes will meet asynchronously.)
Nov. 24-27 Thanksgiving – university closed
(Online classes will meet asynchronously.)
Dec. 9 Last day to withdraw
Dec. 16 Classes end
Dec. 21 University closes at 5 p.m.
Dec. 22-Jan. 2
Winter recess – university closed

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Spring Semester 2017

Undergraduate Classes

Semester-long Classes

Jan. 3-6	Registration for part-time students
Jan. 3	University opens
Jan. 6	Residence hall check-in for new students
	Orientation and registration for new students
	Final day of registration
	Graduation applications due for Class of 2017
Jan. 7	Residence hall check-in for returning students
Jan. 9	Classes begin
	Last day for 100% refund
	First tuition installments due
	Library opens
	Co-op work period begins
Jan. 16	Martin Luther King Jr. Day – university closed
Jan. 17	Electronics, physics and chemistry labs open
	Learning Center opens
Jan. 23	Last day for 75% refund
	Last day to add a course
Jan. 30	Last day for 50% refund
Feb. 6	Last day for 25% refund
	Last day to drop course without W
	Second tuition installments due
Feb. 6-13	Financial Aid Disbursement Week/ Pell Census
Mar. 3	Final tuition installment due
Mar. 13-17	Spring recess (service offices open)
Mar. 20	Classes resume
	Last day to drop course with W or change to audit
Apr. 5	Registration for summer semester begins for continuing students
Apr. 12	Pre-registration for fall semester begins for continuing students
May 1	Classes end
	Last day to withdraw
	Electronics, physics and chemistry labs close
	Learning Center closes
	All library materials are due
	Last day for cooperative education work
May 2-8	Final examinations
May 8	Library closes
May 9	Residence halls close at 7 p.m.
May 13	Commencement

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Graduate Classes

Semester-long Classes

Jan. 3	University opens
	Final day of registration
Jan. 4	Classes begin
	Last day for 100% refund
	First 50% tuition installment due
	Graduation applications due for Class of 2017
Jan. 16	Martin Luther King Day -- university closed. (Online courses will meet asynchronously.)
Jan. 18	Last day for 75% refund
	Last day to add a course
Jan. 25	Last day for 50% refund
Feb. 1	Last day for 25% refund
	Final 50% tuition installment due
Mar. 8	Registration for summer session begins
Mar. 15	Last day to drop or audit course
Apr 12	Pre-registration for fall semester begins
Apr 18	Last day to withdraw
Apr 25	Classes end
May 13	Commencement

Spring -- Term 1

Jan. 3	University opens
	Final day of registration
Jan. 4	Classes begin
	Last day for 100% refund
	First 50% tuition installment due
	Graduation applications due for Class of 2017
Jan. 11	Last day for 75% refund
	Last day to add a course
Jan. 16	Martin Luther King Day -- university closed. (Online courses will meet asynchronously.)
Jan. 18	Last day for 50% refund
Jan. 25	Last day for 25% refund
	Last day to drop or audit course
Feb. 1	Final 50% tuition installment due
Feb. 21	Last day to withdraw
Feb. 28	Classes end

Spring -- Term II

Feb. 28	Final day of registration
Mar. 1	Classes begin
	Last day for 100% refund
	First 50% tuition installment due
Mar. 8	Last day for 75% refund
	Last day to add a course
	Registration for summer session begins
Mar. 15	Last day for 50% refund
Mar. 22	Last day for 25% refumd
	Last day to drop or audit a course
Mar. 29	Final 50% tuition installment due
Apr. 12	Pre-registration for fall semester begins
April 18	Last day to withdraw
April 25	Classes end
May 13	Commencement

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Summer Session 2017

Undergraduate Classes

Session-long Classes

May 12 Final day of registration
August graduates notify Office of Registration and Records
Cooperative education work period begins

May 15 Classes begin
Last day for 100% refund for 8- and 11-week courses
First tuition installments due
Library opens

May 22 Last day for 75% refund for 8-week courses
Electronics, physics and chemistry labs open
Last day to add a course

May 29 Memorial Day – university closed

May 30 Second tuition installments due for 8-week courses
Last day for 50% refund for 8-week courses
Last day for 75% refund for 11-week courses

June 6 Last day for 25% refund for 8-week courses
Last day to drop 8-week course without W
Last day for 50% refund for 11-week courses

June 7 Last day to drop 8-week course with W or audit 8-week course

June 12 Last day for 25% refund for 11-week courses
Last day to drop 11-week course without W
Second tuition installments due for 11-week courses

June 12-19 Financial Aid Disbursement Week/ Pell Census

June 26 Final tuition installment due for 8-week courses

July 3 Last day to withdraw from 8-week courses
Last day to drop 11-week course with W or audit 11-week course
Classes end for 8-week courses

July 4 Independence Day – university closed

July 5-11 Final exams for 8-week courses

July 10 Final tuition installment due for 11-week courses

July 25 Classes end for 11-week courses
Electronics, physics and chemistry labs close
All library materials are due
Last day to withdraw from 11-week courses

July 26-Aug. 1
Final exams for 11-week courses

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

Graduate Classes

Semester-long Classes

Apr. 28 Final day of registration

May 1 Classes begin
Last day for 100% refund
First 50% tuition installment due

May 12 Last day for 50% refund

May 13 Commencement

May 15 Last day for 75% refund
Last day to add a course

May 29 Memorial Day – university closed (Online classes will meet asynchronously.)

May 30 Last day for 25% refund
Final 50% tuition installment due

July 4 Independence Day – university closed (Online classes will meet asynchronously.)

July 10 Last day to drop or audit course

Aug. 11 Last day to withdraw

Aug. 18 Classes end

Summer – Term I

Apr. 28 Final day of registration

May 1 Classes begin
Last day for 100% refund
First 50% tuition installment due

May 8 Last day for 75% refund
Last day to add a course

May 13 Commencement

May 15 Last day for 50% refund

May 22 Last day for 25% refund
Last day to drop or audit course

May 29 Memorial Day – university closed (Online classes will meet asynchronously.)

May 30 Final 50% tuition installment due

June 16 Last day to withdraw

June 23 Classes end

Summer – Term II

June 23 Final day of registration

June 26 Classes begin
Last day for 100% refund
First 50% tuition installment due

July 3 Last day for 75% refund
Last day to add a course

July 4 Independence Day – university closed (Online classes will meet asynchronously.)

July 10 Last day for 50% refund

July 17 Last day for 25% refund
Last day to drop or audit course

July 24 Final 50% tuition installment due

Aug. 11 Last day to withdraw

Aug. 18 Classes end

Refer to Capitol Technology University's online calendar at www.CapTechU.edu for an updated calendar.

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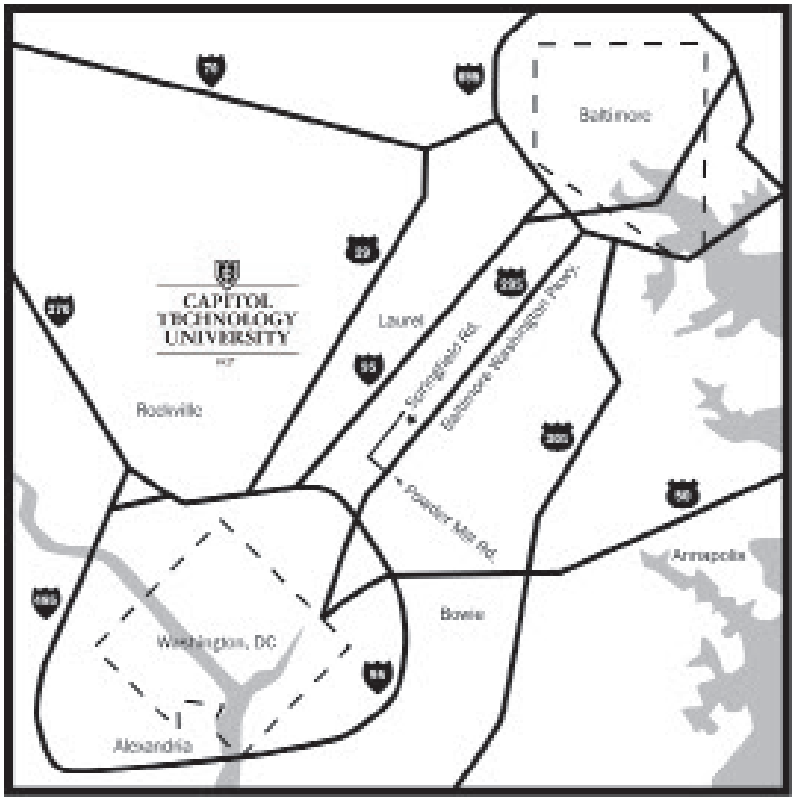
Map and Directions



Directions from Washington, DC and points south of Laurel, MD:

Take the Baltimore/Washington Parkway (Exit 22, north off I-95) to the Beltsville Powder Mill Road exit. Turn left on Powder Mill Road and take the first right onto Springfield Road. Follow Springfield Road one mile. Capitol Technology University is on the right.

Directions from Baltimore, MD and points north of Laurel, MD:

Take the Baltimore/Washington Parkway (Exit 7, south off I-695) to the Beltsville Powder Mill Road exit. Turn right on Powder Mill Road and take the first right onto Springfield Road. Follow Springfield Road one mile. Capitol Technology University is on the right.

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