CAPITOL TECHNOLOGY UNIVERSITY

2021-2022 CATALOG

Capitol Technology University
Catalog 2021-2022

Graduate Studies

Courses

Resources

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
Online Learning 866-960-9620

Undergraduate Admissions admissions@CapTechU.edu

Graduate Admissions gradadmit@CapTechU.edu

Website www.CapTechU.edu

Office Hours

The following offices are open 8:30 a.m.-5:00 p.m. Monday-Friday

Executive Council
President
Vice President of Academic Affairs
Vice President of Student Engagement and University Development
Senior Vice President of Enrollment Management and Marketing
Vice President of Human Resources and Risk Management
Vice President of Facilities Management and Professional Development
Interim Vice President of Finance and Administration
Office of the Dean
Academic Dean
Career Services
Communications and Publications
Human Resources

The following offices are open.
Admissions
Monday and Friday 8:30 a.m.-5:00 p.m.; Tuesday-Thursday 8:30 a.m.-5:30 p.m.
After hours by appointment.

Business Office
Financial Aid
Registration and Records
Student Life
Online Learning
Monday-Thursday 8:30 a.m.-10:00 p.m; Friday 8:30 a.m.-10:00 p.m.

Emergency Closing

In the event of severe weather or other emergencies, 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 and 888-522-7486, 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.

Accreditation

Capitol Technology University is authorized by the State of Maryland (through the Maryland Higher Education Commission, 6 N Liberty St, Baltimore, MD 21201) to confer Bachelor of Science (B.S.) degrees in Astronautical Engineering, Business Analytics and Data Science, Computer Engineering, Computer Engineering Technology, Computer Science, Construction Management and Critical Infrastructure, Construction Safety, Counterterrorism, Cyber Analytics, Cybersecurity, Electrical Engineering, Electrical Engineering Technology, Engineering Technology, Facilities Management and Critical Infrastructure, Information Technology, Management of Cyber and Information Technology, Mechatronics Engineering, Mechatronics and Robotics Engineering Technology, Mobile Computing, Software Engineering, Technology and Business Management, and Unmanned and Autonomous Systems. The University is authorized to confer Associate in Applied Science (A.A.S.) degrees in Computer and Cyber Operations Engineering, Engineering Fundamentals and Wireless Engineering Technology.

The University is authorized by the State of Maryland to confer Master of Science (M.S.) degrees in Aviation, Aviation Cybersecurity, Computer Science, Construction Cybersecurity, Construction Safety, Counterterrorism, Critical Infrastructure, Cyber Analytics, Cybersecurity, Electrical Technology, and Unmanned Systems Policy. The University is authorized by the State of Maryland to confer a Master of Business Administration (M.B.A.) degree. The University is authorized by the State of Maryland to confer Master of Research (M.Res.) degrees in Aviation Maintenance and Cyberpsychology. The University is authorized by the State of Maryland to confer Technical Master of Business Administration (T.M.B.A.) degrees in Business Analytics and Data Science, and Cybersecurity.

The University is also authorized by the State of Maryland to confer a Doctor of Science (D.Sc.) in Cybersecurity, and Doctor of Philosophy (Ph.D.) degrees in Artificial Intelligence, Aeronautical Science, Business Analytics and Data Sciences, Construction Science, Critical Infrastructure, Emergency and Protective Services, Esports Management, Facilities Management, Financial Cybersecurity, Healthcare Cybersecurity, Human Factors, Manufacturing, Occupational Health and Safety, Product Management, Technology, Space Cybersecurity and Unmanned Systems Applications. The University is authorized by the State of Maryland to confer a combined Master of Science (M.S.) in Research Methods and Doctor of Philosophy (Ph.D.) in Technology.

Capitol Technology University is accredited by the Middle States Commission on Higher Education, 3624 Market Street, Philadelphia, PA 19104 (267-284-5000) www.msche.org The Middle States Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

Several degrees offered by Capitol Technology University have received the distinction of being accredited by the Accreditation Board for Engineering and Technology (ABET) http://abet.org.

The following degrees have received accreditation by the Engineering Accreditation Commission of ABET:

- The BS degree in Astronautical Engineering
- The BS degree in Computer Engineering
- The BS degree in Electrical Engineering

The following degrees have received accreditation by the Engineering Technology Accreditation Commission of ABET :

- The BS degree in Computer Engineering Technology
- The BS degree in Electronics Engineering Technology

The following degrees have received accreditation by the Computing Accreditation Commission of ABET:

- The BS degree in Computer Science
- The BS degree in Cybersecurity

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. Per Section 504 of the Rehabilitation Act, the university prohibits discrimination based on disability.

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 Vice President of Human Resources and Risk Management, Katy DeHart; any Vice President of the university; or to the Department of Education's Office of Civil Rights.

Melinda Bunnell-Rhyne
Vice President of Student Engagement and University Development
Title IX Coordinator and Section 504 Coordinator
11301 Springfield Rd., Laurel, MD 20708
301-369-2491
deanofstudents@CapTechU.edu

Shirley Washington
Director of Human Resources
Title IX Deputy
11301 Springfield Rd., Laurel, MD 20708
240-965-2465
hr@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, the Office of Financial Aid, the Business Office, the Office of Career Services, the Office of Student Life, and the 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, Vice President of Student Engagement and University Development. 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. 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.

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.

The Capitol Technology University Commitment

Capitol Technology University guarantees its qualified bachelor's degree graduates placement in the fields of engineering, engineering technology, computer science, 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 bachelor's degree seeking students (U.S. citizens or permanent residents). Application for redemption of this waiver must be made within 210 days of degree conferral or completion.

Contact the Office of Career Services for more information.

Location

Laurel Campus

Capitol Technology University occupies the grounds of the former Beltsville Speedway.

Located just off the Baltimore-Washington Parkway, the 52-acre 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, the Patuxent Wildlife Research Center, and NSA, Fort Meade.

The lush, suburban campus features 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 interactive classrooms and the following academic centers: Center for Cybersecurity Research and Analysis, the Space Operations Institute, Security Operations Center, and the Space Flight Operations Training Center. The William G. McGowan Academic Center also houses the following labs: Cyber Lab, Fusion Lab, Identity Credentialing and Access Management (ICAM) Lab, and the Quantum Computing Lab. The buildings have high ceilings, skylights and exterior reflective glass walls overlooking the woods. Innovator's Hall offers apartment-style housing for up to 220 students.

Mission, Vision and Learning Goals

Motto

Our university motto, ***Aut viam inveniam aut faciam*** (Latin), which translates to "Either Find a Way or Make One," reflects the tenacity and resourcefulness of our campus community.

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

By 2025, in accordance with the Mission Statement, Capitol Technology University will be seen by its constituents and by the public as:

- A STEM-focused institution of higher education, providing undergraduate and graduate degrees in engineering, information sciences, and technology leadership, that has flexibility and opportunities to grow, and that adapts offerings to emerging workforce 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, research and entrepreneurial activities for the professions we serve,

and that benefit a diverse community of learners.
- An organization that is closely linked to its constituency of local, regional and national partners in business, government, non-profits, and professions that provide influence for future technology development and policies.
- An organization that engages the global community, through educating international students, coordinating with educators, and supporting multinational professional associations.
- 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.
- A university that prepares graduates for jobs and careers, and that serves the broader purpose of education to address national needs-based policies through scientific consideration.
- An organization appropriately sized for quality education and financial viability, with sustainable assets for faculty and staff to provide a best-value STEM education.

Core 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, faculty and staff
- Communication –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 diversity of American higher education, which enriches the teaching and learning environment. Motivated high school graduates come to Capitol Technology University ready for educational experiences that will expand their career opportunities. Working adults, veterans and transfer students come to Capitol Technology University to complete undergraduate programs of study that will enhance their career opportunities. Established professionals come to Capitol Technology University to expand their skills by earning graduate degrees or participating in short-term learning experiences.

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.
- Communication – Mastery of traditional and technological techniques of conveying ideas effectively and 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 lifelong 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

Capitol Technology University has identified four strategic goals that will move the institution to the next level of excellence and support the vision.

Expand Educational Offerings, Increase Program Completion

Capitol Technology University offers career-relevant curricula with quality learning outcomes. The strategy includes continuing to expand educational offerings, increasing program completion, and raising learner qualifications and outcomes.

Increase Enrollment and Institutional Awareness

Capitol will accelerate its goal pursuit to become more globally renowned and locally active through student, faculty and staff activities. By 2025, enrollment will grow to 650 undergraduates, 350 master’s students, and 250 doctoral candidates.

Improve the Utilization of University Resources and Institutional Effectiveness while Expanding Revenue

Capitol will likely continue to be 80% financially dependent on student tuition and fees. The university plans to enhance its resources by expanding the range and amount of funding from other streams and aligning costs with strategic initiatives.

Increase the Number and Scope of Partnerships

Capitol’s service to our constituents and sources of financial viability both depend upon participation with continuing and new partner corporations, agencies and schools.

History

Since its start more than 90 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 (CREI), in 1927 by Eugene H. Rietzke. A Navy veteran and radio operator, Rietzke saw the need for an advanced school that would 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 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 Associate of Applied Science degrees. The school expanded its reach to new programs in applied engineering and electronics. The institute also changed its name to Capitol Institute of Technology (CIT) in 1964. CIT awarded its first Bachelor of Science degrees in 1966 to four graduates of its electronics engineering technology program. Anticipating the need for more room, CIT relocated in 1969 to Kensington, Maryland.

During the following decade, enrollment increased as well as program offerings. In 1976, the Middle States Association of Colleges and Secondary Schools granted accreditation to Capitol. The National Science Foundation also 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.

In 1980, the college found its home in Laurel, Maryland. Within three years, Capitol purchased the 52-acre former site of the Beltsville Speedway, built new academic facilities and opened its doors. The college added two more engineering technology degrees after experiencing a surge in enrollment. 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 the late 1980s, Capitol's leadership again recognized the transformation in the institution. The technical-based curriculum had become broader by increasing the number of humanities and social science courses offered. With a spacious campus and the addition of four-year degrees, the school had shed its skin as a technical institute. Preferring a title and an environment that would better suit the evolving institution, 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.

The period of growth continued in the 1990s. Capitol College began offering master's degrees. The college began several outreach efforts and business partnerships, such as the NASA PREP summer program for minority students and the Maryland Distance Learning Network. As the 20th century came to a close, the college also 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 beginning of the next era for the college. The academic center expanded the Department of Computer Science, Space Operations Institute, and the BRAC-funded Cyber Battle Lab.

In 2010, Capitol College launched its first-ever doctoral degree. The doctorate in information assurance prepared students for leadership roles in the burgeoning field of cybersecurity. Since the college offered the degree almost exclusively online, Capitol began accepting doctoral students from across the globe. Four years later, the institution added its second doctoral degree in management and decision sciences.

The increased growth and diversity of programs led the college to become Capitol Technology University in 2014. Since then, the University has embarked on a long-term strategic plan of continued expansion, including the addition of new facilities on campus and increased academic programs. In 2017, Dr. Bradford L. Sims became the eighth president of Capitol Technology University, inheriting the proud legacy that began with Eugene H. Rietzke.

As a respected regional leader, Capitol Technology University continues to attract 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 the University 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 12 educational partners.

Today, Capitol Technology University is the only independent university in Maryland that specializes in providing a relevant education in engineering, business, and related fields. The institution takes pride in its proven record of placing graduates in competitive careers with salaries higher than the industry average. Capitol Technology University currently offers three associate degrees, 24 bachelor's degrees, 13 master's degrees, and 16 doctoral degrees.

The Centers of Excellence

Center of Cybersecurity Research and Analysis (CCRA)

The Center for Cybersecurity Research and Analysis serves as the university hub for training, research, analysis, and programming in all things cybersecurity. Learn to defeat simulated cyberattacks, land an internship where you can put your skills to work and prepare for the workforce, publish a scholarly article addressing an existing challenge in the field, and much more. Students–both on-ground and online–faculty, alumni, and community partners alike are welcome.

As one of the first schools in the nation to be designated a National Center of Excellence in Cyber Defense by the Department of Homeland Security and National Security Agency, Capitol Technology University stands ready to advance the field and do its part to combat one of the nation's greatest challenges.

Space Operations Institute (SOI)

The Space Operations Institute (SOI) was established at Capitol in 2003 with a grant from the National Aeronautics and Space Administration (NASA). The SOI provides support for educational programs that prepare students for careers in the aerospace industry. Through the SOI and its resources, students gain experience in satellite mission operations and planning, and in developing and operating a picosatellite ground system.

In 2017, the Space Flight Operations Training Center (SFOTC) was established as part of the SOI, with sponsorship from the Hammers Company. This unique resource utilizes state-of-the-art flight simulation and telemetry software, enabling students to gain hands-on training in real time.

Students enrolled at Capitol may apply for an industry sponsored or internal university SOI internship. Industry sponsored student interns work at NASA, the employer's facility, or on campus. The SOI interns have worked on the James Webb Telescope at the Space Telescope Science Institute in Baltimore, Maryland among other missions.

STEM Outreach Center

The STEM Outreach Center provides hands-on education and workforce development experiences for students in secondary and post-secondary schools and those who support them in achieving leadership careers in science, technology, engineering and math (STEM) fields.

The Center seeks to educate and develop the future leaders of STEM career fields through utilizing space science, astronomy and other related areas of study at Capitol Technology University to engage students.

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

1. 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 **and**
2. support the dissemination of information regarding STEM workforce and leadership opportunities.

Security Operations Center

The Security Operations Center (SOC) is the facility that houses the university's information security team responsible for monitoring and analyzing Capitol Tech's security posture on an ongoing basis. The SOC team's goal is to detect, analyze, and respond to cybersecurity incidents using a combination of technology solutions and a strong set of processes.

Critical Infrastructure Center

Capitol Technology University is the first university to educate students in degree areas combining operations training of critical infrastructure facilities; critical information technology (IT) and operational technology (OT) which can be vulnerable to cyber attacks, especially when coupled; the industrial internet of things (IIOT); and the cybersecurity needed to protect these facilities. The Critical Infrastructure Center (CIC) is Capitol Tech's hub of Critical Infrastructure (CI) and CI education.

Affiliations, Memberships and Partnerships

ACE Mentor Program

The ACE Mentor Program of America, Inc. (ACE) helps mentor high school students and inspires them to pursue careers in design and construction. Capitol provides scholarships for ACE students.

Air University-Associate to Baccalaureate Cooperative (AU-ABC)

The AU-ABC directs Airmen with associate in applied science degrees from the Community College of the Air Force (CCAF) to accredited "military friendly" colleges and universities for completing a four-year degree. The program maximizes the application of military career education and training.

Chesapeake Lighthouse Foundation

To promote access and opportunity for Chesapeake Lighthouse Foundation students, Capitol Tech offers scholarships to any graduate of a Chesapeake Lighthouse Foundation high school for full-time attendance at Capitol Tech in an on ground academic program.

City of Alexandria

Capitol Tech and the City of Alexandria have established a partnership in support of the training and education needs of the City of Alexandria employees. City of Alexandria employees receive a tuition discount.

CSFI

The Cyber Security Forum Initiative (CSFI) mission is to provide cyber warfare awareness, guidance, and security solutions through collaboration, education, volunteer work and training to assist the U.S. Government, U.S. Military, commercial interest, and international partners.

First Generation College Bound

Since its start in 1990, First Generation College Bound has held after-school homework clubs at Capitol to help teens become the first in their families to attend college.

FIRST Robotics Competition

Annually, Capitol annually hosts the Chesapeake Regional remote kickoff for the international robotics contest. FIRST (For Inspiration and Recognition of Science and Technology) strives to inspire high school students to be part of the nation's next generation of scientists, engineers, researchers and technicians. Capitol provides scholarships for FIRST students.

Fort Meade Alliance

As a part of the Fort Meade Alliance, Capitol works together with business and community leaders to promote and support Fort George G. Meade.

Future Kings

Future Kings is an after-school program for young men in under-served communities to explore career opportunities in STEM. To promote access and opportunity for Future Kings participants, Capitol Tech offers scholarships to any Future Kings participant for full-time attendance at Capitol Tech in an on ground academic program.

ICIT

The Institute for Critical Infrastructure Technology (ICIT) is the nation's leading cybersecurity think tank. ICIT programs and initiatives support cybersecurity leaders and practitioners in all 16 critical infrastructure sectors.

Institute of Electrical and Electronics Engineers

Capitol is a participating university partner with the Institute of Electrical and Electronics Engineers. Master's students who hold full or graduate student membership in IEEE at the time of registration will receive a 10 percent discount on tuition charges upon verification.

Maryland MESA

Maryland MESA (Mathematics Engineering Science Achievement) prepares K-12 students for academic and professional careers in mathematics, engineering, science and technology.

Maryland National Guard

Capitol has established a partnership with the Maryland National Guard that allows guard members to take up to 12 credit hours per academic year at one-half the full tuition cost. Capitol is the only institution that offers members such a substantial discount on master's and undergraduate programs.

Maryland Space Grant Consortium (MDSGC)

The MDSGC, part of NASA's National Space Grant College and Fellowship Program, contributes to the nation's science enterprise by funding research, education, and public service projects through a national network of 52 college-based Space Grant consortia.

NAEMSE

Capitol Tech and the National Association of EMS Educators (NAEMSE) have established a partnership in support of the training and education needs of the NAEMSE members. NAEMSE members receive a tuition discount.

National Cryptologic School (NCS)

Capitol established a partnership with the NSA's National Cryptologic School to provide National Security Agency employees and Department of Defense partners with the opportunity to transfer NCS credits toward completing their degree at Capitol. Degrees applicable to this program include bachelor's, master's and doctorate.

National CyberWatch Center

Capitol is a member of the National CyberWatch Center, an Advanced Technological Education Center funded by a grant from the National Science Foundation. The center, 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 National CyberWatch Center's mission is to increase the quantity and quality of the cybersecurity workforce through increased education, curriculum development, faculty development, student development, career pathway exploration and development and public awareness.

National Defense University

Capitol has partnered 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

Capitol is designated by the National Security Agency and the Department of Homeland Security as a Center of Academic Excellence (Cyber-Defense). The Center of Academic Excellence program is intended to reduce vulnerabilities in the national information infrastructure by promoting higher education in IA, and producing a growing number of professionals with cybersecurity expertise in various disciplines. University applicants are assessed against published criteria intended to measure depth and maturity of programs in IA. The criteria are specified in courseware training standards issued by the Committee on National Security Systems (CNSS). Capitol received its initial CAE designation in 2003 and has been re-designated three times.

National Society of Black Engineers (NSBE)

Active at the regional and national levels, NSBE's mission is to encourage minorities to pursue engineering and technical-related degrees at undergraduate and graduate levels. NSBE offers free tutoring for members and service to the college and community.

NISOD

Capitol Tech, has a partnership with National Institute of Staff and Organizational Development to provide support of the educational needs of the NISOD members. NISOD members receive a tuition discount.

PTSA

Capitol Tech and the Public Safety Technology Alliance have established a partnership in support of the training and education needs of PTSA employees and to explore opportunities to market public safety technology trends and issues. PTSA employees receive a tuition discount.

ROTC

Capitol, in collaboration with the University of Maryland, College Park (UMCP), offers perspective and current students the opportunity to participate in UMCP’s ARMY ROTC Program.

Society of Women Engineers

SWE is the largest nonprofit educational and service organization representing student and professional women in engineering and technical fields. Its mission is to stimulate women to achieve full potential in careers as engineers and leaders, expand the image of the engineering profession as a positive force in improving the quality of life and demonstrate the value of diversity.

SAME

Capitol Tech has a partnership with Society of American Military Engineers (SAME) to promote and provide education and professional development for SAME members. SAME members receive a tuition discount for courses.

TARC

Team America Rocketry Challenge (TARC) is the world’s largest student rocket contest. Nearly 5,000 students from across the nation compete each year. Capitol provides scholarships for TARC students.

Partner Institutions

Capitol Technology University has collaborated with numerous state and regional colleges to provide transfer agreements in certain degree fields. These colleges include Anne Arundel Community College, Augusta Technical College, Baltimore City Community College, Carroll Community College, Catawba Valley Community College, College of Southern Maryland, Community College of Baltimore County, Delaware Technical Community College, Delta College, Forsyth Community College, Hagerstown Community College, Harford Community College, Howard Community College, Montgomery Community College, Northern Virginia Community College, the

National Security Agency (on behalf of the National Cryptologic School), Prince George's Community College, University of New Haven, Volunteer State Community College, and WorWic Community College.

International Partner Institutions

AAB College, Pristina, Kosovo; Catholic University Institute of Buea (CUIB), Buea, Cameroon; and Istanbul Aydın University, Istanbul, Turkey.

Online Learning

Capitol Technology University makes it possible for busy professionals to earn master's degrees, doctorates, or technology-related certificates on their own schedule. The university offers many of its degree programs in a flexible, asynchronous format. Capitol professors, drawn from the ranks of skilled professionals in their fields, are accessible and ready to assist students and prospective students with any questions they may have.

Other programs offer the option of a live, virtual classroom format in which students can interact with their instructor and fellow students in real time. All live classes are recorded and available for later replay.

All of Capitol's master's degree programs are offered entirely online. Our pioneering doctoral programs in cybersecurity (DSc) and business analytics and data science (PhD) are primarily online, with an annual residency during which you will work with Capitol faculty members to shape your research ideas into a finished project. All of our other doctorate programs are offered in a no-residency, researched-focused modality.

The university also offers a variety of online classes for undergraduates. For instance, students pursuing a BS degree in business administration, cybersecurity or management of cyber and information technology have the option of completing their last two years online.

The following BS degree programs are entirely online

- Construction Information Technology and Cybersecurity
- Construction Management and Critical Infrastructure
- Construction Safety
- Counterterrorism
- Cybersecurity
- Facilities Management and Critical Infrastructure
- Professional Trades Administration

Academic Policies

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 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 and online.

Cross-Divisional Registration

Students pursuing an undergraduate degree who wish to enroll in graduate courses must meet with their department chair and receive approval 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 and online.

Independent Study

Independent study in a course will be granted only in the most extraordinary circumstances. Eligibility for an independent study course will be determined by a committee comprised of academic department chairs, academic advisors and academic support staff. If the committee or advisor determines that a student is eligible for an independent study course, the appropriate department chair will assign a professor and the student will be registered for the course by the Office of Registration and Records. The assigned professor will organize all course requirements including exams, homework, lab assignments and research papers in lieu of classroom participation. Students interested in an independent study course should submit an independent study request form 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 student’s department chair 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 considering 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 department chair 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 must complete all the requirements for both degrees plus a minimum of twelve distinct semester hours of credit. 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 their department chair for advisement.

All students declaring a second degree must have academic department chair approval and complete the change of degree program form. This form is available 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 following section). Deadline dates for dropping a course with or without a W from a course are listed in the university calendar 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. Any student receiving financial aid or VA benefits must see a financial aid administrator before withdrawing. Consult the university calendar for specific withdrawal dates.

Active Duty Withdrawal Policy

Members of the active duty military, reserves or National Guard who are called into active service may withdraw from classes and receive a full refund of tuition and fees for the semester. The student must present a copy of their military orders to the dean of students along with a withdrawal form to process the withdrawal.

Students who wish to receive incomplete (I) grades for courses interrupted by a call to active service must make arrangements with their individual professors. Faculty will determine whether an incomplete grade is appropriate by taking into account factors such as amount of work remaining, a student's performance in class, mode of instruction, etc. Students who receive incomplete grades will not receive refunds for those courses. The student must then complete coursework by the end of the fourth week of the next term, or the I grade 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 Vice President for Academic Affairs must approve changes in grades.

Students are responsible for keeping their professors informed of any military related absences.

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 have not maintained continuous enrollment must resubmit an application for admission. 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.

Continuous Enrollment

To be considered continuously enrolled, a student must not have more than one academic year (three consecutive semesters) of non-enrollment with the university.

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, including 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 the LOA. At leave expiration, students must re-enroll or (if qualified) request an LOA extension. If the student has not returned at the end of the 180-day period, the school is required to notify the Department of Education of the student's last date of attendance. This will affect the student's federal financial aid and 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 the 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 their academic department chair.

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 an advisor 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, provided the student's financial account is current.

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 Quality Standard 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.*

Credit-Bearing Courses

The following policy defines the credit hour at Capitol Technology University in accordance with applicable federal and state regulations.

Capitol Technology University defines the credit hour as an approximation of the learning outcomes equivalent of the Carnegie Unit. Courses are developed and evaluated to ensure that the amount of student learning required per credit is equivalent to one (50 minute) hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks or two (50 minute) hours of direct faculty instruction and four hours of out-of-class student work in an eight-week graduate sub-term for one semester hour of credit or at least an equivalent amount of work for other academic activities as established by the institution, including laboratory work, internships, independent study and other academic work leading to the award of credit hours.

Student learning outcomes reflect differences in course delivery methods, type of instruction and interaction, degree of supervision, measurements of student work, academic disciplines and degree levels.

All credit-bearing courses with the exception of doctoral dissertation research, writing and presentation courses require syllabi, which will include the number of credit hours, class meeting times and approximate schedule of required assignments.

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 grade (I) may be given due to unavoidable and verifiable circumstances only at the end of a semester or term to those students whose work is current, up until the day of the emergency, but who have left unfinished a small amount of work – for instance, a final examination, a paper, or a term project which may be completed without further class attendance.

When a grade of incomplete (I) is assigned, the professor will specify the work necessary to complete the course and receive a grade, the deadline date for completion, and the grade to be assigned if the work is not completed by the specified date. The latest date for the deadline is the fourth week of the next term. It the student does not make the deadline the incomplete will be converted to the grade the professor specified. After six months, the VPAA must approve changes in grades.

In the event that the instructor from whom students receive an incomplete is no longer available, the disposition of students' eventual grade resides with the appropriate department chairperson.

Incompletes need department chair approval.

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 on the MyCapitol portal 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

If a student questions the assigned grade in a course, the student must first exhaust all possibilities to resolve the questions through discussion, dialogue, and written communication with the instructor. If the student is unable to resolve the problem by these efforts, the student is required to speak with the chair of the department in which the course is offered. The purpose of such conversations is to clarify possible misunderstandings or to remedy failures of communication (an informal appeal process).

If no resolution is reached in the informal appeal process, the student may engage the formal appeal process by appealing to the Vice President for Academic Affairs (VPAA). Filing a formal appeal with the VPAA requires the completion of designated forms on the Registration and Records portion of the MyCapitol Portal.

Students who wish to file a formal appeal of an assigned grade must follow the steps outlined below.

- Review the section titled "Basis for Appeal" in the Grade Appeal Policy to be sure you have legitimate grounds for appealing your grade. Any grounds for appeal other than those listed will be considered irrelevant.
- Contact the instructor within 14 calendar days of the posting of the grade and try to reach a resolution concerning the grade. This step must be documented by filling out Form #1on the MyCapitol Portal.
- If no resolution occurred with the instructor, contact the chairperson of the department in which the course is taught and try to reach a resolution concerning the grade. This step must be documented in Form #1 on the MyCapitol Portal.
- If no resolution was reached with the chairperson, a formal grade appeal may be submitted to the VPAA using Form #2 within 30 calendar days of the conclusion of the informal appeal. Form 1 along with any relevant supporting material, must be included when Form 2 is submitted to the VPAA.
- The informal grade appeal should be completed within 30 calendar days after the appeal was initiated.
- **Students who are graduating at the end of the semester the grade was assigned:** You must contact the VPAA within one week of the posting of the

grade to inform him/her that you plan to appeal the grade and are beginning the informal appeal process by contacting the instructor and chairperson.

- **Students who are claiming the second basis (see below) for appeal listed in the Grade Appeal Policy:** If the appeal proceeds to the VPAA and/or grade appeal committee, you are required to provide a list of the names of other students and specific assignments so that a review of the relevant materials and appropriate comparisons can be made. You must obtain express written permission from each student listed before including his/her name in the grade appeal.

Basis for Appeal of an Assigned Grade

An appeal may be filed by a student based on one or more of the following grounds only:

1. An error in the calculation of the grade.
2. Assignment of a grade by application of more exacting/demanding standards than were applied to other students in the same section of the same course, in the same semester, with the same instructor.
3. Assignment of a grade on some basis other than performance in the course.
4. Assignment of a grade that is a substantial departure from the instructor's previously announced standards for that section of that course.
5. Assignment of a grade that is a substantial departure from the written departmentally approved standards for a course.

Any other grounds for appeal shall be considered irrelevant.

Informal Appeal

All students must follow the informal appeals process for questioning grades prior to engaging the formal appeal. Students must initiate their informal appeal **within 7 calendar days** of the posting of the grade. Should no resolution occur by the informal appeal, the student may choose to engage the formal appeal process as noted below in items 1, 2 & 3. The student should initiate the informal process through email or face-to-face meeting.

1. **Student to Meet with Instructor.** In so doing, they are to, where possible, seek out the instructor for a face-to-face conversation.
2. **Instructor to Give Due Consideration.** The instructor is encouraged to listen to the entirety of the student's case and then to consider whether the current grade is appropriate.
3. **Student to Contact Department Chairperson.** Should no resolution occur, the student is required to contact the department chairperson. The chairperson is required to meet with the student one- on-one, to seek a conversation with the instructor one-on-one, and then highly encouraged to meet with the two of them together.

Formal Appeal

For grade appeals involving courses taught at Capitol Technology University, students must complete the Capitol Technology University Grade Appeal Forms found on the MyCapitol Portal and submit it to the Capitol Technology University VPAA's Office. When filing an appeal, a student must specify the basis of the appeal and do so **within 30 calendar days** of the conclusion of the informal appeal. The student must indicate one of the following:

1. **Instructor Unwilling to Communicate.** The instructor is unable or unwilling to communicate with the student on the appeal and the informal appeal could not proceed.
2. **No Resolution.** No resolution resulted from the informal appeal process.

Contents of Formal Appeal

The student should attach to the appeal forms as much of the relevant physical and electronic record as is possible to collect. If the basis of differential standards is asserted, the student should provide a list of the names of other students and specific assignments so that a review of the relevant materials and appropriate comparisons can be made.

Verification of Appropriateness of Appeal

For appeals of grades submitted by instructors who have been terminated, resigned, or retired, it is the VPAA's responsibility to manage the notification process. In doing so, the VPAA shall make three separate attempts at contact within 30 calendar days, with the last one in writing by registered letter to the last known address. If after ten working days of the VPAA's receiving the registered letter receipt the instructor still refuses to discuss the grade appeal, the VPAA shall convene the Grade Appeal Committee.

If an instructor has denied the grade appeal after having met with the department chairperson, the VPAA must review the materials and discuss the matter with the student. The VPAA may choose to discuss the matter with the instructor, the chairperson, or both. If the VPAA cannot create a resolution satisfactory to the instructor and student, the VPAA shall convene the Grade Appeal Committee.

Grade Appeal Committee

The Grade Appeal Committee will consist of five members with one alternate from the Faculty Advisory Council appointed by the VPAA. Members of a department may serve on the grade appeal of a departmental colleague. When the instructor in question is a member of the committee, she/ he is recused and the alternate shall serve in her/his place.

Without regard to the calendar, once a formal appeal has been submitted to the committee, that committee shall remain with the appeal until its conclusion. If two or more grade appeals are received by the VPAA about the same instructor and same course, the committee can determine to combine them into one process if the committee determines the students' rights to appeal are not compromised.

The Grade Appeal Committee will review all materials from the previous steps of the grade appeal process. If necessary, the Grade Appeal Committee may request additional materials from the student and/or the instructor that are pertinent to the specific case.

Grade Appeal Committee Actions

The Grade Appeal Committee, by majority vote, shall ***within 10 calendar days or ask for exception baring the need for additional information*** recommend one of the following:

1. That the original grade stands
2. That any higher grade be substituted for the original grade
3. That an incomplete grade be granted. (If this recommendation is made, the departmental chairperson shall be appointed the instructor of record for the course for this student. The conditions for completion, the default grade, and the expiration of the incomplete shall be specified by the Grade Appeal Committee.)

Transmission

When a recommendation is made by the Grade Appeal Committee, the Grade Appeal Committee shall prepare a written summary of the recommendation and transmit the recommendation to the VPAA. Within 10 calendar days, the VPAA will transmit the recommendation to the student, instructor, and chairperson.

If a grade change is recommended, the VPAA shall prepare a letter to the Registrar stating the new grade. The letter will carry the signature of the VPAA and the members of the committee. No such letter is required if there is no change in grade.

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 Vice President for Academic Affairs for recommendation.

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 50 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 doctoral 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, MA-112 or MA-114 and EN-101 through placement testing, or successful completion of MA-005 and EN-001 after two attempts, will be suspended from the university until it is demonstrated that they can achieve and maintain good academic standing at the university level by successfully completing MA-110, MA-112 or MA-114 and EN-101 (depending on their degree program) at another accredited college or university with a grade of C or better.

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 Vice President for Academic Affairs 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 re-mediated 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.

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. Students 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 30-59 semester credits
Junior 60-89 semester credits
Senior 90 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.

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 their academic department chair. 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 40 of this catalog.

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 54.

Graduation Requirements

Capitol Technology University conducts an 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, including a grade of C or better on their Senior Project capstone course, 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 Vice President for Academic Affairs 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.

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 completed the exit interview survey 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 boasts 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

Sigma Beta Delta encourages and recognizes scholarship and achievement among students of business, management and administration. The organization also promotes 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.

Upsilon Pi Epsilon

It is the express purpose of Upsilon Pi Epsilon (UPE) to promote the computing and information disciplines and to encourage their contribution to the enhancement of knowledge.

The mission of UPE is to recognize academic excellence at both the undergraduate and graduate levels in the Computing and Information Disciplines. UPE is a member of the Association of College Honor Societies (ACHS). UPE has received endorsements from the two largest computer organizations in the world, the Association for Computing Machinery (ACM) and the IEEE Computer Society (IEEE-CS). UPE is also a charter member of The International Federation of Engineering Education Societies (IFEES). UPE both installed the Capitol chapter and inducted the charter members in April 2018.

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 academic evaluator will consult with faculty who teaches the course at Capitol Technology University if there is a need or a concern. If there is a need or concern, the student is expected to provide sufficient documentation that is requested to support the transferred credit approval. A copy of the official transfer evaluation will be included in the student's folder. 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:

- Course content must be equivalent to the content of Capitol's course
- 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 36 in the Catalog.
- Courses completed more than five years prior to enrollment at Capitol Technology University will be reviewed on a case-by-case basis.

Capitol Technology University may 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)
- DANTES Subject Standardized Test Program (DSST)
- StraighterLine courses
- Advanced Placement (AP)
- International Baccalaureate (IB)
- Massive Open Online Course (MOOC)**

* Credits transferred are limited to the first two years and approximately 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 an official Joint Services Transcript (JST) to the Capitol Technology University Admissions Office or 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

Undergraduate 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 Vice President for Academic Affairs or the student's department chair must grant permission for the examination to be given. Validation examinations are thorough and cannot be taken a second time. In addition, a student may not request a validation exam for a course in which a grade of D or lower has been earned.

Students interested in taking a validation exam should visit the Office of Registration and Records, where forms and procedures (including fees) 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 (CompTIA A+,N+,S+,CEH, CISSP, OWSP)

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 Undergraduate Academic Advisor and Assistant Director of Registration and Records and approved in writing by the student's academic department chair.

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.

NCCER Transfer Policy

The National Center for Construction Education & Research (NCCER) and Capitol Technology University have a MHEC reviewed and approved agreement for NCCER credential completers to have their credential evaluated for technical elective credit. These technical elective credits may transfer into any baccalaureate program. The number of technical elective credit hours from NCCER programs may not exceed 42 credits. Students from accredited 2-year or 4-year institutions may transfer additional credits. However, a maximum of 70 credits can be transferred from a combination of NCCER and 2 year institutions. The National Center for Construction Education & Research is located via https://www.nccer.org

For all NCCER Certifications, one (1) semester hour of credit will be awarded for a minimum of fifteen (15) hours of NCCER approved training where each hour is composed of fifty (50) minutes of actual class time, exclusive of registration, study days, and holidays, when supervision is assured and learning is documented. One (1) semester hour of credit will also be awarded for a minimum of thirty (30) hours of NCCER approved training where each hour is composed fifty (50) minutes each of supervised laboratory time, exclusive of registration, study days, and holidays, when supervision is assured and learning is documented.

A minimum of 30 credit hours must be completed from Capitol Technology University to obtain any baccalaureate degree regardless of the total amount of credit transferred in towards the degree.

Graduate Transfer Policies

Master's Transfer Policies

Unofficial transfer credit evaluations are completed during the admissions process in consultation with the academic departments. 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.

A maximum of twelve semester credits of comparable accredited coursework taken elsewhere may be applied toward a master's 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 master's level. In some cases, military training that is part of a completed master's degree may be used as transfer credit. Once the student enrolls at Capitol Technology University, all remaining credits must be completed at Capitol Technology University except in the case of students who participated in selected DoD programs, who may be eligible to transfer up to 15 credit hours into named Masters' programs.

At the master level, any student applying that has courses taken within ten years prior to admission will be considered for transfer, and courses that were last taken more than ten years prior to admission will be reviewed on a case-by-case basis. Once accepted, master level transfer credits do not expire.

Doctoral Transfer Policies

At the doctoral level, any student applying that has courses taken within ten years of admission will be considered for transfer, and courses that were last taken more than ten years prior to admission will be reviewed on a case-by-case basis. If the last class is less than 10 years prior to admission all the classes completed on that course will be considered. Once accepted, doctoral transfer credits do not expire and the 7-year rule of completion will now be 10 years. If a doctorate student takes more than 10 years then approval will be needed from the VPAA to agree. Only courses with a B or better will be accepted for transfer, if dissertation work and a satisfactory or passing grade awarded, they too will be accepted.

Maryland allows for up to a 6-credit transfer from Masters' degrees towards a doctorate when the award has a minimum of 36 credits. For these to be applied to the D.Sc. or Ph.D. in Business Analytics & Data Science the credits must match the syllabus at 75% except in the case of students who participated in selected DoD programs, who may be eligible to transfer up to 15 credit hours into named Doctoral programs. On specific master's degrees where the University has a MOU we will accept up to 12 credits.

For research-based doctoral programs, up to 42 credits of graduate-level work will be considered for transfer, with up to six of these credits being master's level coursework. For those that have completed a doctorate degree, regardless of when, 42 credits may be transferred on the research degree.

Students having qualification from outside the USA and having studied for a doctorate degree but not completed they will need two years full time or 3 years part-time to qualify for 42 credit transfer as many universities do not have classes for credit. Traditionally European/UK PhD are three years full time as a minimum. If the Doctorate degree is from Europe or the UK style they will unlikely have a transcript; their degree awarded certificate will be used, 42 credits transferred, and this decision will be approved by the VPAA.

Tuition/Financial Aid

Tuition and Fees

The following rates are in effect for the 2021-2022 academic year beginning fall 2021 and continuing through summer 2022. Tuition rates are subject to change without notice.

Undergraduate Tuition

Full-time/Part-time Tuition

Full-time 2021-2022 tuition, per semester (12-18 credits) $12,915

Full-time 2021-2022 credits above 18 (per credit) $1,077

Part-time 1-11 credits (per credit) $846

Audited courses (per credit) $846

Anytime online, standard rate* (per credit), plus fees $450

Anytime online, partnership rate* (per credit), plus fees $360

Eligibility for this rate requires acceptance into an anytime online program. Additional discounts and scholarships do not apply.

Military Tuition Rates

Undergraduate active duty military tuition rate **$250

(Per credit, plus fees)

Undergraduate retired military tuition rate $746

(Per credit, plus fees)

*****Additional discounts and scholarships do not apply***

Graduate Tuition

Master's Programs

Online or satellite site (per credit), plus fees $630

Independent study (per credit), plus fees $877

Online 3-credit course, including fees $1,974

Active duty military tuition* (per credit), plus fees $350

Retired military tuition* (per credit), plus fees $530

*Additional discounts and scholarships do not apply.

Doctoral Program

Per credit $933

3-credit course $2,799

Active duty military tuition* (per credit) $833

Retired military tuition* (per credit) $883

Additional discounts and scholarships do not apply.

Fees

Admissions

Undergraduate paper application $25

Undergraduate online application FREE

Master's program online application FREE

Processing fee for international students $75

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 $153

Full-time commuter students (12+ credits) $87

Part-time commuter students (1-11 credits) $16

Information Technology (per semester)

Undergraduate Full-time (flat fee, 12+ credits) $409

Undergraduate Part-time (per credit, 1-11 credits) Master’s (per credit) $28

CITI Exam Fee for Initial Doctoral Course $50

Write and Cite Exam Fee for Initial Doctoral Course $50

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 conferred at same time $75

Validation Exam $500

Lab Fees

Level 1 Lab Fee $25

Level 2 Lab Fee $50

Level 3 Lab Fee $75

Level 4 Lab Fee $100

Level 5 Lab Fee $350

Level 6 Lab Fee $500

International Student Fee (per semester) $770

Campus Residence Halls (per semester)

Single occupancy bedroom	$4,136 - $4,214
Double occupancy bedroom	$3,616
Triple occupancy bedroom	$2,968
Room reservation fee	$150
Security deposit (refundable)	$50

Student services	$153
Communication fee	$150

On-Campus Summer 2022 Housing

Single occupancy bedroom TBD

Full-Time Student Tuition Cap

Capitol Technology University offers a tuition-cap program for undergraduate students registered full time. Academic year tuition increases are capped at a maximum of 1% per year from the students' first full-time semester for up to five years. To remain eligible for the tuition-cap 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 for due dates.)
- Remain in good academic standing. (See page 33 for academic performance.)

If these terms are not met, the student will no longer be eligible for the tuition cap 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 53)
- VA benefits (see page 54)
- 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 using a deferred payment plan; 50 percent of tuition is due upon registration and the remaining balance is due four weeks after classes begin. 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
- VA benefits (see page 54)
- Employer sponsorship
- Employer reimbursement

Doctorate Program Payment Options

- Full payment prior to start of classes
- Financial aid (see page 56)
- VA benefits (see page 54)
- 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 (master's 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 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 Term 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

Military Tuition Assistance Refund Policy

Military Tuition Assistance (TA) is awarded to a student under the assumption that the student will attend school for the entire period for which the assistance is awarded. When a student withdraws, the student may no longer be eligible for the full amount of TA funds originally awarded. To comply with the Department of Defense policy, Capitol Technology University will return any unearned TA funds on a proportional basis through at least the 60% portion of the period for which the funds were provided. TA funds are earned proportionally during an enrollment period, with unearned funds returned based upon when a student stops attending. If a service member stops attending due to a military service obligation, Capitol Technology University will work with the affected service member to identify solutions that will not result in a student debt for the returned portion.

When a student “officially” withdraws from a course, the date of withdrawal will be used as the last date of attendance. If a student receives a grade of F (failure for nonattendance) for a course, that is considered an “unofficial” withdrawal. For unofficial withdrawals, Capitol Technology University will determine the last date of attendance by reviewing the last date of activity within a course. For online courses, Capitol Technology University will determine last date of attendance based on the last date a student made a contribution to the class or submitted an assignment. For on-campus courses, Capitol Technology University will reach out to the professor to determine the last date of attendance.

Once last date of attendance has been determined, Capitol Technology University will recalculate the student's TA eligibility based on the following formula: Percentage earned equals number of days completed divided by total number of days on the course.

Determining eligibility for TA is class specific. The start and end date will be used for each class to determine eligibility. Using the formula above, Capitol Technology University will be required to return to the Department of Defense some or all of the TA awarded to service members that did not complete at least 60% of each course, possibly creating a balance on the Capitol Technology University student account.

Federal Return of Funds Policy

The Office of Financial Aid 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 semester 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 semester or term, the Office of Financial Aid 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 semester or term completed = the number of days completed up to the withdrawal date divided by the total days in the semester 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 for the semester 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 Loans
- Subsidized Direct Loans
- Federal Perkins Loans
- Direct PLUS Loans
- Federal Pell Grants
- Federal Supplemental Opportunity Grants

According to federal regulation, a financial aid student who receives all F's 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 degree-seeking undergraduate students and graduate students enrolled in a minimum of six credits 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 the 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 as early as October 1, 2020, or by priority date of March 1, 2021, or as far in advance of the starting term as possible. Apply online with FAFSA at www.fafsa.ed.gov. 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 or 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, unless otherwise 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 to 8 credits is considered half-time
- 9 to 11 credits is considered three-quarter's 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's 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 52.

Federal Satisfactory Academic Progress (SAP) Standards

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

This policy applies to both undergraduate and graduate students receiving federal and state financial aid funds. The 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 students must earn each enrollment period and year of study are listed in the guidelines on page 45 and on the university website. Additionally, for an undergraduate student, 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 a student's academic program is 120 credit hours, the maximum period must not exceed 180 (120 x 1.5) attempted hours.

To be in compliance, students must complete their credit hours as listed in the guidelines above.

Failure to meet these standards will place a student on financial aid warning for one semester.

A student on financial aid warning will receive financial aid for one more semester. Before registering for classes, the student must meet with a 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 3.0 Cumulative Grade Point Average. Failure to meet this standard will place a student on financial aid warning for one semester. A student on financial aid warning will receive financial aid for one more semester. Before registering for classes, the student must consult with their advisor on the best course options.

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

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 the letter of appeal, a student must explain the reason for his or her poor academic performance and provide medical documentation or other documents which help to explain any exceptional circumstances.

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

If an appeal is granted, the student will be placed in a probationary status for one additional 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 degree-seeking 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 number of honors, AP, or IBA courses taken. 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 college 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 who continue to meet the awarding criteria will be considered for subsequent scholarship awards. 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 must 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.

Matching State Grant

Beginning fall 2021, Capitol is offering a Matching State Grant to non-Maryland and District of Columbia residents. Students must apply to their State Higher Education Agency, submit required documentation, receive an award notification from their state and forward it to the Office of Financial Aid. Confirmed awards will be matched up to $5,000 for the award year.

These awards are not renewable and must be applied for each year.

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. SEOG funds are limited and awarded to students with the most need on a first come, first serve basis. To be eligible, students must complete a FAFSA.

Maryland Part-Time Grant

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

Guaranteed Access Partnership Program

The Guaranteed Access Partnership Program (GAPP) provides a matching grant award to eligible Maryland students who receive a Guaranteed Access (GA) grant and who enroll at Capitol Technology University as a new undergraduate student. Students who complete the FAFSA by March 1 will automatically be considered for the GA grant by the

Maryland Higher Education Commission. Additional documentation may be required before the award can be made. Award amounts for the GA grant and matching GAPP grant are determined by your financial need and cost of attendance. An eligible student may receive a GAPP grant equal to the GA grant up to the full cost of tuition and fees.

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 Subsidized and Unsubsidized Loans, graduate PLUS loans for students, and parent PLUS loans. Students can apply for loans online through the Department of Education website, www. studentloans.gov, using their FSA ID.

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 undergraduate students under the Federal 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 per week and must be enrolled full-time.

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 campus departments. Admitted students can contact the Office of Human Resources for more information. Like the Federal Work-Study program, students are limited to 20 hours per week and must be enrolled full-time.

Other Aid Programs

Private Organizations

In addition to federal, state and institutional financial aid programs, private organizations 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. Organizations connected with family, friends, and fields of interest, such as the American Society of Professional Engineers or the Society of Women Engineers, are also options.

A scholarship packet has been developed by the Office of Financial Aid 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, veteran's benefits or both, students must be enrolled in a degree program and submit all necessary transcripts. Non-degree students are not eligible for veteran's benefits or federal financial aid. Certification and certificate courses are not eligible for veteran's 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

As required by 38 USC 3679(e), students (or "covered individuals") receiving educational assistance under Chapter 31 VR&E, or Chapter 33, Post-9/11 GI bill benefits will not be assessed late payment fees or have a registration hold placed on their account. Covered individuals receiving chapter 31 or chapter 33 benefits will not be required to secure alternative or additional funding to cover the VA benefit amount by the tuition due date and will not be denied access to any school resources due to delayed VA payments.

If the covered individual's eligibility does not cover the entire assessed amount of tuition and fees, the student is responsible for the difference in total tuition and fees and the covered eligibility amount by the university's posted tuition and fee payment deadline.

To qualify for this provision, students must provide the university with a Certificate of Eligibility or VR&E equivalent by the first day of class, along with a request for certification of benefits and any other required information essential to the VA course certification process.

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 Studies

Undergraduate Program Offerings

Associate of Applied Science (AAS) Degrees

- Computer and Cyber Operations Engineering
- Engineering Fundamentals
- Wireless Engineering Technology

Bachelor of Science (BS) Degrees

- Astronautical Engineering
- Computer Engineering
- Computer Engineering Technology
- Computer Science
- Construction Information Technology and Cybersecurity
- Construction Management and Critical Infrastructure
- Construction Safety
- Counterterrorism
- Cyber Analytics
- Cybersecurity
- Data Science
- Electrical Engineering
- Electronics Engineering Technology
- Engineering Technology
- Esports Management
- Facilities Management and Critical Infrastructure
- Information Technology
- Management of Cyber and Information Technology
- Mechatronics Engineering
- Mechatronics and Robotics Engineering Technology
- Professional Trades Administration
- Software Engineering
- Technology and Business Management
- Unmanned and Autonomous Systems

Programs of Study

Capitol Technology University's programs of study for Associate of Applied Science and Bachelor of Science degrees are outlined beginning on page 50.

Minors

- Computer Science
- Cybersecurity
- Esports and Gaming Administration
- Game Development
- Unmanned and Autonomous Systems

Requirements for undergraduate minors are outlined beginning on page 105.

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 107.

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.

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 152. All degree-seeking undergraduate students are required to take courses in humanities and the social sciences to broaden their understanding of professional and ethical responsibilities within a global context.

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 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.

Computer Science and Engineering Applicants

Applicants to the computer science and 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).

Computer science and engineering applicants who do not meet these additional criteria, but meet the general admissions criteria, will be accepted into one of our other degree programs, such as engineering technology, 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 application/housing deposit to the university. The tuition deposit is credited to the applicant's first-semester tuition.

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 paper applications. (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 40 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. Applicants who are not eligible to transfer college level math or English credits must take placement tests. Applicants with experience in computer programming who are not eligible to transfer college level credits in computer science are encouraged to take placement testing, those who choose not to take placement testing will register for CS-100. Applicants with experience in cybersecurity who are not eligible to transfer college level credits in cybersecurity are encouraged to take placement testing, those who choose not to take placement testing will register for IAE-201.

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 152. All degree-seeking undergraduate students are required to take courses in humanities and the social sciences to broaden their understanding of professional and ethical responsibilities within a global context.

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 40 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. Applicants who are not eligible to transfer college level math or English credits must take placement tests. Applicants with experience in computer programming who are not eligible to transfer college level credits in computer science are encouraged to take placement testing, those who choose not to take placement testing will register for CS-100. Applicants with experience in cybersecurity who are not eligible to transfer college level credits in cybersecurity are encouraged to take placement testing, those who choose not to take placement testing will register for IAE-201.

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 152. All degree-seeking undergraduate students are required to take courses in humanities and the social sciences to broaden their understanding of professional and ethical responsibilities within a global context.

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. Forward an up-to-date official high school transcript to the Office of Admissions.
3. Forward a letter of recommendation from the high school principal or guidance counselor.
4. Meet with an admissions counselor at Capitol Technology University for a personal interview. Students may also be required to meet with the Academic Dean and/or Dean of Student Life.

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 55 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. Applicants who are not eligible to transfer college level math or English credits must take placement tests. Applicants with experience in computer programming who are not eligible to transfer college level credits in computer science are encouraged to take placement testing, those who choose not to take placement testing will register for CS-100. Applicants with experience in cybersecurity who are not eligible to transfer college level credits in cybersecurity are encouraged to take placement testing, those who choose not to take placement testing will register for IAE-201.

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

Non-degree seeking students must submit an official transcript showing appropriate degree (i.e. if students are applying for graduate credits, a bachelor's degree transcript must be submitted) or completed coursework.

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 $75 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:

1. 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.
2. 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.

Associate Degrees (AAS)

Computer and Cyber Operations Engineering (AAS)

The Associate of Applied Science in Computer and Cyber Operations Engineering equips students with the cybersecurity skills required to protect computer systems and networks. The degree provides a firm foundation in network security, digital electronics and microprocessors, security fundamentals, cryptography and programming.

Course Requirements

Associate of Applied Science 62 Credits

Course Credits

Technical 27 Credits

CS-150 Programming in C 3
CS-200 Programming in C++ 3
CT-152 Introduction to UNIX 3
EL-100 Introduction to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices and Circuits 3
EL-204 Digital Electronics 3
EL-262 Microprocessors and Microassembly 3
NT-150 Computer Networking 3

Cybersecurity 15 Credits

IAE-201 Introduction to Information Assurance Concepts 3
IAE-250 Comprehensive Computer and Network Security 3
IAE-260 Secure System Administration and Operation 3
IAE-325 Secure Data Communication and Cryptography 3
IAE-351 Introduction to Cyber Network Operations 3

Mathematics 11 Credits

MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry 4
MA-261 Calculus I 4

Humanities and Social Sciences 9 Credits

EN-101 English Communications 3
Humanities Elective 3
Social Science Elective 3

Engineering Fundamentals (AAS)

The Associate of Applied Science in Engineering Fundamentals provides students with a foundation in mathematics, physics, electronics, and engineering mechanics. The degree enables students to enter the workforce as engineering technicians and/or pursue a bachelor's degree in a variety of engineering disciplines, including electrical, computer, mechanical, biomedical, civil, chemical and systems engineering.

Course Requirements

Associate of Applied Science 62 Credits

Course Credits

Electronics and Engineering 30 Credits

EL-100 Introduction to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices and Circuits 3
EL-204 Digital Electronics 3
EL-261 Introduction to Communication Circuits/Systems 3
EL-262 Microprocessors and Microassembly 3
MEC-155 Introduction to Materials Science 3
MEC-210 Engineering Mechanics - Statics 3
MEC-215 Introduction to Engineering Design CAD 3
MEC-310 Engineering Mechanics - Dynamics 3

Computer Science 3 Credits

CS-150 Programming in C 3

Mathematics and Science 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

Humanities and Social Sciences 12 Credits

EN-101 English Communications I 3
EN-102 English Communications II 3
Humanities Elective 3
Social Science Elective 3

Wireless Engineering Technology (AAS)

The Associate of Applied Science in Wireless Engineering Technology provides students with a foundation in electronics technology with an emphasis on laboratory work and to prepare graduates to work in technical positions of the electronics technology industry.

Theoretical courses are included to prepare students who are continuing with the bachelor's degree.

Course Requirements
Associate of Applied Science 62 Credits
Course Credits

Electronics and Engineering 30 Credits
EL-100 Introduction to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices and Circuits 3
EL-204 Digital Electronics 3
CT-240 Internetworking with Routers and Switches 3
TC-110 Introduction to Telecommunications 3
EL-261 Introduction to Communication Circuits/Systems 3
EL-210 RF Fundamentals 3
TC-319 Network Infrastructure Security 3
Technical Elective* 3

Computer Science 3 Credits

CT-152 Introduction to UNIX 3

Mathematics and Science 17 Credits

MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry 4
MA-261 Calculus I 4
PH-201 General Physics I 3
EL-240 Mobile and Cellular Communication Systems 3

Humanities and Social Sciences 12 Credits

EN-101 English Communications I 3
EN-102 English Communications II 3
Humanities Elective 3
Social Science Elective 3

Bachelor’s Degrees

Astronautical Engineering (BS)

The Bachelor of Science in Astronautical Engineering provides 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 Flight Operations Training Center. The focus is on spacecraft and ground systems design rather than research. The program produces skilled systems-oriented astronautical engineers to support the needs of NASA and the aerospace industry.

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 students will complete a capstone in which they propose, design, develop and deliver a satellite mission plan or other space-related project.

The Bachelor of Science in Astronautical Engineering is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Course Requirements
Bachelor of Science 120 Credits
Course Credits

Astronautical Engineering 45 Credits

AE-100 Introduction to Astronomy 3
AE-150 Introduction to Space 3
AE-250 Ground Systems Engineering 3
AE-311 Spacecraft Systems 3
AE-350 Autonomous Ground Systems 3
AE-351 Orbital Mechanics 3
AE-361 Remote Sensing 3
AE-411 Space Systems Engineering 3
AE-451 Propulsion 3
AE-454 Spacecraft Dynamics/Attitude/Control 3
AE-455 Satellite Communications 3
AE-457 Senior Design Project I 3
AE-458 Senior Design Project II 3
Technical Electives 3
Technical Electives 3

Computer Science 3 Credits

CT-206 Introduction to Scripting Languages 3

Engineering 6 Credits

MEC-215 Introduction to Engineering Design CAD 3
EE-453 Control I 3

Engineering Technology 15 Credits
EL-100 Introduction to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices/Circuits 3
EL-204 Digital Electronics 3
EL-250 Advanced Analog Circuits 3

Mathematics and Science 30 Credits
MA-261 Calculus I 4
MA-262 Calculus II 4
MA-263 Calculus III 4
MA-330 Linear Algebra 3
MA-340 Ordinary Differential Equations 3
PH-261 Engineering Physics I 4
PH-262 Engineering Physics II 4
PH-263 Engineering Physics III 4

Humanities and Social Sciences 15 Credits
HU-331 or HU-3 32 Arts and Ideas 3
SS-351 Ethics 3
Social Science Electives 3
Social Science Electives 3
Humanities Elective 3

English Communications 6 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3

Computer Engineering (BS)

The Bachelor of Science in Computer Engineering teaches students to design and program computers and computer-based systems, including the latest embedded technology. The program produces practical design engineers capable of analyzing the technical needs of society. Students study digital systems, computer organization and architecture, software design and testing, operating systems and programming languages, micro-controller systems, and the latest programmable chip technology. Upon graduation, students will be equipped to integrate hardware and software solutions to meet systems requirements. All students will complete a capstone in which they propose, design, build, test and deliver a computer-based system.

Course Requirements
Bachelor of Science 122 Credits
Course Credits

Prerequisites 15 Credits
EL-100 Introduction to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices/Circuits 3
EL-204 Digital Electronics 3
EL-262 Microprocessors and Microassembly 3

Computers/Programming 21 Credits
CS-150 Programming in C 3
CS-200 Programming in C++ 3
CS-220 Database Management 3
CS-230 Data Structures 3
CS-418 Operating Systems 3
CT-152 Introduction to UNIX 3
IAE-201 Introduction to Information Assurance Concepts 3

Engineering 27 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-457 Senior Design Project I 3
EE-458 Senior Design Project II 3
Technical Elective 3
Technical Elective 3

Math/Science 32 Credits
MA-355 Numerical Analysis 4
MA-124 Discrete Math 3
MA-261 Calculus I 4
MA-262 Calculus II 4
MA-340 Ordinary Differential Equations 3
MA-345 Probability/Stats for Engineers 3
PH-261 Engineering Physics I 4
PH-262 Engineering Physics II 4
CH-120 Chemistry 3

Humanities/Social Sciences 21 Credits
BUS-301 Project Management 3
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Humanities Elective 3
Humanities Elective 3
Social Science Elective 3
Social Science Elective 3

English Communications 6 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3

Computer Engineering Technology (BS)

The Bachelor of Science in Computer Engineering Technology teaches students to work at the interface between hardware and software, linking digital technology to computer applications. Students study software design and testing, operating systems, programming languages, digital systems, computer organization and architecture, micro-controller systems and the latest programmable chip technology. All students will complete a capstone course in which they propose, design, build, test and deliver a computer-based system. The Bachelor of Science in Computer Engineering Technology is accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org.

Course Requirements

Bachelor of Science 120 Credits

Course Credits

Technical 39 Credits
CS-220 Database Management 3
CS-230 Data Structures 3
CS-418 Operating Systems 3
CT-240 Internetworking/Routers/Switches 3
EE-304 Digital Design I 3
EE-354 Digital Design II 3
EE-362 Microcontroller System design 3
IAE-201 Intro/Info Assurance Concepts 3
SE-457 Senior Design Project I 3
SE-458 Senior Design Project II 3
TC-319 Network Infrastructure Security 3
Technical Elective 3
Technical Elective 3

Mathematics and Science 30 Credits
MA-128 Introduction to Statistics 3
MA-262 Calculus II 4
PH-202 General Physics II 3

Humanities and Social Sciences 21 Credits
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Social Science Electives 3

Computer Science Electives 6 Credits*

Computer Science (BS)

The Bachelor of Science in Computer Science teaches students to design and program computers and computer-based systems. The program produces practical computer system specialists who can apply computer theory and algorithmic principles to the design of computer-based systems. Students study programming languages, computational science, algorithms, computer architecture and software engineering. Other topics include machine learning, data mining, artificial intelligence, human-computer interaction, intelligent systems, information management and the social and professional issues associated with the practice of computer science. All students will complete a capstone course in which they propose, design, build, test and deliver a computer-based system.

Course Requirements
Bachelor of Science 122 Credits
Course Credits

Computer Science 60 Credits
CS-120 Introduction to Programming Using Python 3
CS-130 Introduction to Programming Using Java 3
CS-150 Programming in C 3
CS-200 Programming in C++ 3
CS-220 Database Management 3
CS-225 Intermediate Java Programming 3
CS-230 Data Structures 3
CS-240 Introduction to Data Mining 3
CS-310 Computer Algorithms 3
CS-305 Android App Development 3 ***OR*** CS-330 iPhone App Development 3
CS-360 Text Mining and Natural Language Proccesing 3
CS-370 Computer Vision 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
CS-250 Introduction to Network Programming Using C 3 ***OR*** CS-356 Dynamic Web Page Development 3 ***OR*** CT-406 Web Programming Languages 3
CS-440 Advanced Machine Learning 3
CS-457 Senior Design Project I 3
CS-458 Senior Design Project II 3

Technical 9 Credits
EL-204 Digital Electronics 3
EL-262 Microprocessors and Microassembly 3
EE-364 Computer Architecture 3

Mathematics and Science 17 Credits
MA-124 Discrete Mathematics 3
MA-128 Introduction to Statistics 3
MA-261 Calculus I 4
MA-262 Calculus II 4
MA-330 Linear Algebra 3

Science 6 Credits
PH-201 General Physics I 3
Science Elective 3

Humanities and Social Sciences18 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Humanities Electives 3
Social Science Elective 3

General Electives 6 Credits*

****6 credits of computer science or technical courses***

Construction Information Technology and Cybersecurity (BS)

The Bachelor of Science in Construction Information Technology and Cybersecurity prepares students for the latest technological developments, applications, and considerations in the construction industry are explored and applied to real-life industry challenges. Students will learn optimum methods and techniques to define resources, risks, and threats in order to maintain the protection, safety, and profitability of construction sites.

Course Requirements
Bachelor of Science 121 Credits
Course Credits

Computer Science 12 Credits
CS-200 Programming in C++ 3
CS-220 Database Management 3
CS-230 Data Structures 3
CS-310 Computer Algorithms 3

Computer Programming 15 Credits
CT-102 Introduction to Internet Applications 3
CT-152 Introduction to UNIX 3
CT-206 Scripting Languages 3
CT-376 Javascript 3
CT-406 Web Programming Languages 3

Critical Infrastructure 9 Credits
CRI-210 Critical Infrastructure I 3
CRI-310 Critical Infrastructure II 3
CRI-410 Critical Infrastructure III 3

Mathematics and Science 22 Credits
MA-112 Intermediate Algebra 3
MA-114 Algebra & Trigonometry 4
MA-124 Discrete Mathematics 3
CH-120 Chemistry 3
PH-201 General Physics I 3
CS-130 Intro to Programing Using Java 3
CS-150 Intro to Programming Using C 3

Construction Management 12 Credits
CM-120 Intro to Construction Management 3
CM-125 Construction Graphics and Plan Reading 3
CM-220 Construction Methods and Materials 3
CM-250 Legal Issues in Construction 3

Construction Software 15 Credits
CTC-200 Construction IT and Cybersecurity Issues 3
CTC-220 BIM and Graphic Software 3
CTC-240 Estimating Software 3
CTC-260 Scheduling Software 3
CTC-280 Construction Project Management Software 3

Cybersecurity 18 Credits

NT-150 Computer Networking 3
IAE-201 Introduction to Information Assurance Concepts 3
IAE-250 Comprehensive Computer/Network Security 3
IAE-260 Secure Systems Administration and Operation 3
IAE-325 Secure Data Communications and Cryptography 3
IAE-402 Introduction to Incident Handling/Malicious Code 3

Humannities, Social Sciences, Management 18 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
HU-331 Arts and Ideas 3
SS-351 Ethics 3
Social Science Elective 3
Humanities Elective 3

Undergraduate Studies

Construction Management and Critical Infrastructure (BS)

The Bachelor of Science in Construction Management and Critical Infrastructure prepares students for leadership roles in construction management and critical infrastructure protection. Laboratory work supplements classroom lectures to provide practical skills. Students gain additional real-world experience through participation in a required internship. With its comprehensive, management-oriented focus and critical infrastructure training, the program helps students understand the impact of construction on the environment and society. All students will complete a capstone in which they propose, design and develop a construction management project.

Course Requirements
Bachelor of Science 121 Credits
Course Credits

Construction Management 39 Credits
CM-120 Introduction to Construction Management 3
CM-125 Construction Graphics and Plan Reading 3
CM-220 Construction Methods and Materials w/lab to cover II 3
CM-230 Estimating I 3
CM-250 Legal Issues in Construction 3
CM-260 Statics and Strengths of Materials (after math and physics) 3
CM-270 Safety Management 3
CM-301 Construction Project Management 3
CM-330 Estimating II 3
CM-350 Construction Planning and Scheduling 3
CM-375 Mechanical and Electrical Systems 3
CM-380 Environmental Systems 3
CM-450 Management of Field Operations 3

Capstone 6 Credits
CM-457 Internship in Construction Management 3
CM-458 Senior Design Project 3

Critical Infrastructure 9 Credits
CRI-210 Critical Infrastructure I 3
CRI-310 Critical Infrastructure II 3
CRI-410 Critical Infrastructure III 3

Business 9 Credits
BUS-270 Financial Accounting I 3
BUS-283 Managerial Accounting 3
BUS-372 Financial Management 3

Cybersecurity 12 Credits
CT-152 Introduction to UNIX 3
IAE-201 Introduction to Cybersecurity 3
IAE-250 Comprehensive Computer/Network Security 3
IAE-325 Secure Data Communications and Crypto 3

Mathematics and Science 19 Credits
MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry4
MA-128 Statistics 3
CH-120 Chemistry 3
PH-201 General Physics 3
UAS-101 Introduction to Unmanned and Autonomous Systems 3

Humanities, Social Sciences, Management 27 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
BUS-174 Introduction to Business and Management 3
BUS-200 Business Communications 3
BUS-282 Economics for Management 3
HU-331 Arts and Ideas 3
SS-351 Ethics 3
Humanities Elective 3
Social Science Elective 3

Construction Safety (BS)

The Bachelor of Science in Construction Safety provides students with the necessary training to become a construction safety professional in the diverse field of occupational health and safety. The program produces highly skilled systems-oriented managers who can use the latest technological developments as a leader in their chosen field. Students learn management principles that keep construction worksites running smoothly. A variety of topics are covered to enable graduates to be marketable, from hiring employees to meeting government regulations to ensuring day-to-day work activities are safe. All students complete a capstone course in which they propose, design, test and deliver a construction safety project.

Course Requirements
Bachelor of Science 121 Credits
Course Credits

Construction Safety 42 Credits
SAF-100 Construction Safety Regulations 3
SAF-120 EM 385 and DOD Construction 3
SAF-214 Hazardous Materials 3
SAF-216 Fire Prevention and Protection 3
SAF-300 Industrial Hygiene I 3
SAF-302 Industrial Hygiene II 3
SAF-304 Ergonomics 3
SAF-316 Safety Management Systems 3
SAF-318 Training and Adult Education 3
SAF-400 Environmental Permitting and Management 3
SAF-402 Construction Safety Management 3
SAF-414 Construction Risk Management 3
SAF-416 Current Issue in Construction Safety 3
SAF-455 Construction Safety Senior Project 3

Construction Management 12 Credits
CM-120 Introduction to Construction Management 3
CM-125 Construction Graphics and Plan Reading 3
CM-220 Construction Methods and Materials 3
CM-250 Legal Issues in Construction 3

Mathematics and Science16 Credits
CH-120 Chemistry 3
MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry4
MA-128 Introduction to Statistics 3
PH-201 General Physics 3

Humanities and Social Sciences 24 Credits
BUS-200 Business Communications 3
EN-101 English Communications I 3
EN-102 English Communications II 3

HU-331 Arts and Ideas 3
SS-351 Ethics 3
Humanities Elective 3
Social Science Electives 3
Social Science Electives 3

Electives 27 Credits
Business or Technical Elective 3
Business or Technical Elective 3
Business or Technical Elective 3
Business or Technical Elective 3
Business or Technical Elective 3
Business or Technical Elective 3
Business or Technical Elective 3
Business or Technical Elective 3
Business or Technical Elective 3

Counterterrorism (BS)

The Bachelor of Science in Counterterrorism will prepare students to use advanced counterterrorism skills to help protect people, businesses, infrastructure, proprietary products and intellectual property. Students will analyze terrorist attack patterns, employ proven methods of prevention to actively counter radicalization and recruitment, as well as to develop, detect and promote early warnings against terrorism.

Course Requirements
Bachelor of Science 124 or 127 Credits
Course Credits

Terrorism and Counterterrorism 33 Credits
CTR-101 Nature of Conflict 3
CTR-102 Terrorism 3
CTR-201 Islam in the Modern World 3
CTR-202 Conventional and Improvised Explosive Devises 3
CTR-203 Chemical, Biological, Radiological, and Nuclear Weapons 3
CTR-301 Terrorist Operations 3
CTR-302 Terrorist Threat Assessments 3
CTR-401 Homegrown Violent Extremism (Domestic Terrorism) 3
CTR-402 Violent Ethno-supremacist and Ultranationalist Groups (Worldwide) 3
CTR-457 Counterterrorism Senior Project I 3
CTR-458 Counterterrorism Senior Project II 3

Intelligence/Critical Infrastructure/Cybersecurity/Unmanned and Autonomous Systems 36 Credits
INT-101 Introduction to Intelligence and Global Security 3

UAS-101 Introduction to Unmanned and Autonomous Systems 3
UAS-102 Mechanics of Unmanned and Autonomous Systems 3
UAS-120 UAS Operator Certification 4
IAE-201 Introduction to Information Assurance Concepts 3
IAE-250 Comprehensive Computer and Network Security 3
CRI-210 Critical Infrastructure I 3
CRI-310 Critical Infrastructure II 3
IAE-311 Mobile Computing Security 3
IAE-320 Mobile Device Forensics 3
IAE-351 Intro to Cyber Network Operations 3
CRI-410 Critical Infrastructure III 3

Math and Computer Science 25 Credits
MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry 4
MA-128 Introduction to Statistics 3
CS-130 Computer Science: Intro to Programming Using Java 3
CS-220 Database Management 3
CS-240 Introduction to Data Mining 3
CH-120 Chemistry 3
PH-201 General Physics I 3

English, Humanities, and Social Sciences 30 or 33 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
HU-121 Arabic I 3
HU-131 Chinese I 3
BUS-174 Introduction to Business and Management 3
HU-331 Arts and Ideas 3
SS-351 Ethics 3
Humanities Elective 3
Humanities Elective 3
Humanities Elective 3
Social Science Elective 3

Cyber Analytics (BS)

The Bachelor of Science in Cyber Analytics prepares students to meet the needs of government, industry, and non-profits to evaluate statistical data to determine the state of the organization’s security posture. These statistics must be combined with relevant facts specific to the entity, including competitors, market position, and socio-political factors to determine the threat landscape. The program combines a foundation in cybersecurity with hands-on project-based coursework, providing analytic experience that can be applied to a wide range of technology areas. All students will complete a capstone in which they propose, design and develop a cyber analytics project.

Course Requirements
Bachelor of Science 121 Credits
Course Credits

Analytics 18 Credits
BUS-101 Intro to Data Science 3
CS-240 Intro to Data Mining 3
CS-350 Data Visualization 3
CS-360 Text Mining & Natural Lang Proccesing 3
CS-370 Computer Vision 3
CS-440 Advanced Machine Learning 3

Information Assurance 33 Credits
IAE-201 Introduction to Information Assurance 3Concepts
IAE-250 Comprehensive Computer and Network Security 3
IAE-260 Secure System Administration and Operation 3
IAE-321 Applied Wireless Network Security 3
IAE-325 Secure Data Communications and Cryptography 3
IAE-390 Penetration Testing 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-457 Senior Design Project I 3
IAE-458 Senior Design Project II 3

Programming and Computer Science 30 Credits
CS-120 Intro to Programming Using Python 3
CS-150 Programming in C 3
CS-200 Programming in C++ 3
CS-220 Database Management 3
CS-230 Data Structures 3
CS-250 Introduction to Network Programming Using C 3
CS-300 Secure Coding 3
CS-418 Operating Systems 3
CT-152 Introduction to UNIX 3
NT-150 Computer Networking 3

Mathematics and Science 16 Credits
MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry4
MA-124 Discrete Mathematics 3
MA-128 Statistics 3

Science Elective (must be AE-150, CH-120, or PH-201) 3

Humanities and Social Science 24 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
BUS-245 Writing and Communication in Data Science
HU-331 Arts and Ideas 3
SS-351 Ethics 3
Humanities Elective 3
Social Science Electives 3
Social Science Electives 3

Cybersecurity (BS)

The Bachelor of Science in Cybersecurity prepares students to fill the skills gap in this growing field. Students gain an understanding of key cybersecurity challenges, including how to secure information and defend the information systems that store it. The program also provides a foundation in computer networking and programming. By the end of the program, students complete coursework that prepares them to pass industry certification exams, including A+, Network+, CEH, CISSP, and Security+, positioning them to graduate with industry credentials.

All students will complete a capstone in which they propose, design, build, test and deliver a computer-based system.

Course Requirements
Bachelor of Science 120 Credits
Course Credits

Programming and Computer Science 33 Credits
CS-120 Intro to Programming Using Python 3
CS-150 Programming in C 3
CS-200 Programming in C++ 3
CS-220 Database Management 3
CS-230 Data Structures 3
CS-250 Introduction to Network Programming Using C 3
CS-300 Secure Coding 3
CS-418 Operating Systems 3
CT-152 Introduction to UNIX 3
CT-240 Internetworking with Routers and Switches 3
NT-150 Computer Networking 3

Information Assurance 33 Credits
IAE-201 Introduction to Information Assurance Concepts 3
IAE-250 Comprehensive Computer and Network Security 3
IAE-260 Secure Systems Administration and Operation 3

IAE-321 Applied Wireless Network Security 3
IAE-325 Secure Data Communications and Cryptography 3
IAE-390 Penetration Testing 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-457 Senior Design Project I 3
IAE-458 Senior Design Project II 3

Management 6 Credits
BUS-101 Introduction to Data Science 3
BUS-301 Project Management 3

Mathematics and Science 12 Credits
MA-112 Intermediate Algebra 3
MA-124 Discrete Mathematics 3
MA-128 Introduction to Statistics 3
Science Elective (must be AE-150, CH-120, or PH-201) 3

Humanities and Social Sciences 24 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Humanities Electives 3
Humanities Electives 3
Social Science Electives 3
Social Science Electives 3

Electives 12 Credits
General Elective 3
General Elective 3
General Elective 3
General Elective 3

Data Science (BS)

The Bachelor of Science in Data Science enables students to integrate business, machine learning and decision-making skills. Students learn how organizations function effectively and obtain a clear picture of how business areas meld to create successful enterprises. The program prepares students to structure, transform and analyze data to gain insights that will provide opportunities to improve business intelligence and data driven decision making. All students will complete a capstone in which they propose, design and develop a business analytics project.

Course Requirements
Bachelor of Science 122 Credits
Course Credits

Business Management 33 Credits
BUS-270 Financial Accounting 3
BUS-275 Human Resource Management 3
BUS-279 Introduction to Leadership 3
BUS-289 Entrepreneurship and Small Business Management 3
BUS-301 Project Management 3
BUS-358 Internship 3
BUS-378 Legal Environment of Business 3
BUS-386 Organizational Theory and Behavior 3
BUS-410 Strategic Management 3
CS-457 Senior Design Project I 3
CS-458 Senior Design Project II 3

Analytics 42 Credits
CS-120 Introduction to Programming Using Python 3
CS-150 Programming in C 3
BUS-101 Introduction to Data Science 3
CS-220 Database Management 3
CS-240 Introduction to Data Mining 3
BUS-240 Statistical Methods in Data Science 3
BUS-245 Writing and Communication in Data Science 3
BUS-284 Data Identification and Collection Strategies 3
BUS-310 Data Mining for Effective Decision Making 3
CS-350 Data Visualization 3
CS-360 Text Mining and Natural Language Processing 3
CS-370 Computer Vision 3
BUS-443 Marketing Analytics: Decision-Making in the Information Age 3
CS-440 Advanced Machine Learning 3

Mathematics and Science 20 Credits
MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry 4
MA-128 Introduction to Statistics 3
MA-261 Calculus I 4
BUS-247 Quantitative Methods for Business Analytics 3
Science Elective 3

Humanities and Social Sciences 21 Credits
BUS-174 Introduction to Business and Management 3
EN-101 English Communications I 3

EN-102 English Communications II 3
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Humanities Elective 3
Social Science Elective 3

Electives 6 Credits
General Electives 3
General Electives 3

Electrical Engineering (BS)

The Bachelor of Science in Electrical Engineering blends theory and practice, directed at engineering design as opposed to research. The program produces practical design engineers capable of analyzing the technical needs of society and creates the next generation of electrical and electronic circuits. Topics covered include circuit theory and modeling, computer-aided circuit simulation, signals and systems, microwave engineering, VHDL and telecommunications. All students will complete a capstone 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 120 Credits
Course Credits

Engineering 63 Credits
EL-100 Introduction to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices and Circuits 3
EL-204 Digital Electronics 3
EL-250 Advanced Analog Circuits 3
EL-261 Introduction to Communication Circuits/Systems 3
EL-262 Microprocessors and Microassembly 3
CS-150 Intro to Programming in C 3
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-453 Control I 3
EE-456 Digital Signal Processing 3
EE-457 Senior Design Project I 3
EE-458 Senior Design Project II 3
EE-460 Electromagnetic Fields 3
EE-461 Communications Theory 3

Technical Elective 3

Mathematics and Science 33 Credits
CH-120 Chemistry 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
PH-261 Engineering Physics I 4
PH-262 Engineering Physics II 4
PH-263 Engineering Physics III 4

Humanities and Social Sciences 18 Credits
BUS-301 Project Management 3
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Social Science Electives 3
Humanities Electives 3
Humanities Electives 3

English Communications 6 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3

Electronics Engineering Technology (BS)

The Bachelor of Science in Electronics Engineering Technology prepares students to work in a range of practical electronics fields, from circuit analysis and digital design to control and robotics. The program provides a foundation in electronics technology with an emphasis on laboratory work. Topics covered include circuit design and simulation, network analysis and synthesis, transmission lines, micro-system design and fiber-optic communications. All students will complete a capstone course in which they propose, design, build, test and deliver a working electronic project.

Course Requirements
Bachelor of Science 121 Credits
Course Credits

Electronics and Engineering 54 Credits
EL-100 Introduction to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices and Circuits 3
EL-204 Digital Electronics 3
EL-212 Transmission Lines 3

EL-250 Advanced Analog Circuits 3
EL-261 Introduction to Communication Circuits/Systems 3
EL-262 Microprocessors and Microassembly 3
EL-301 Advanced Communications Circuits and Systems 3
EE-304 Digital Design I 3
EL-307 Noise and Shielding 3
EE-309 Circuit Design/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-457 Senior Design Project I 3
EE-458 Senior Design Project II 3

Computer Science 3 Credits
CS-150 Introduction to Programming in C 3

Mathematics and Sciences 34 Credits
CH-120 Chemistry 3
MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry 4
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
PH-201 General Physics I 3
PH-202 General Physics II 3

Humanities and Social Sciences 12 Credits
BUS-301 Project Management 3
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Humanities Electives 3

English Communications 6 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3

Electives 6 Credits
Technical Elective 3
General Elective 3

Engineering Technology (BS)

The Bachelor of Science in Engineering Technology prepares students for careers in design, development, manufacturing, analysis, field service engineering, purchasing, technical sales and management. The program provides a foundation in mathematics, applied science, circuit analysis, digital and microcontrollers systems and engineering mechanics. Students use hands- on projects to practice designing, building and testing. All students will complete a capstone course in which they propose, design, build, test and deliver a working electronic project.

Course Requirements
Bachelor of Science 121 Credits
Course Credits

Technical 57 Credits

EL-100 Introduction to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices and Circuits 3
EL-204 Digital Electronics 3
CT-152 Introduction to UNIX 3
CT-240 Internetworking Routers and Switches 3
NT-100 Computer Architecture and Construction 3
NT-150 Computer Networking 3
EL-261 Introduction to Communication Circuits/Systems 3
EL-262 Microprocessors and Microassembly 3
CS-150 Introduction to Programming in C 3
MEC-155 Introduction to Materials Science 3
MEC-215 Introduction to Engineering Design CAD 3
MEC-370 Electronics and Instrumentation 3
MEC-375 Engineering Safety 3
IAE-201 Introduction to Information Assurance Concepts 3
IAE-250 Comprehensive Computer and Network Security 3
TC-458 Senior Design Project 3
Technical Elective 3

Mathematics and Science 22 Credits

CH-120 Chemistry 3
MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry4
MA-128 Introduction to Statistics 3
MA-230 Introduction to MATLAB 3
PH-201General Physics I 3
Math or Science Elective 3

Humanities and Social Sciences 18 Credits

BUS-301 Project Management 3
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Humanities Elective 3
Social Science Elective 3
Social Science or Business Elective 3

English Communications 9 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
EN-408 Writing Seminar 3

Electives 15 Credits
General Elective 3
General Elective 3
General Elective 3
General Elective 3
General Elective 3

Esports Management (BS)

The BS in Esports Management provides a first-rate, cutting-edge education in Esports operations. Students will learn how to apply core management fundamentals tailored to the Esports industry and create a go-to-market digital distribution strategy. Students will understand the nuances and complexities associated with managing Esports teams, events, and leagues. Students will also use those skills in real-world events before graduation. The B.S. degree in Esports Management will prepare students for entry-level positions throughout the exciting Esports industry.

Course Requirements
Bachelor of Science 121 Credits
Course Credits
Game Management 18 Credits
GDV-101 Introduction to Games 3
EGA-120 Introduction to Esports Management 3
GDV-230 Working with Unity 3
EGA-340 Convention, Event, and Trade Show Planning 3
EGA-421 Distribution of Games 3
HU-210 Game Design and Theory 3

Business 12 Credits
BUS-174 Introduction to Business and Management 3
BUS-280 Macroeconomics 3
BUS-289 Entrepreneurship and Small Business Management 3
BUS-358 Internship 3

Marketing and Legal 6 Credits
BUS-376 Marketing Principles 3
BUS-378 Legal Environment of Business 3

Leadership and Management 18 Credits
BUS-275 Human Resource Management 3
BUS-279 Introduction to Leadership 3
BUS-301 Project Management 3
BUS-384 Productions and Operations Management 3
BUS-386 Orgaizational Theory and Behavior 3
BUS-410 Strategic Management 3

Computer Programming 9 Credits
CS-120 Introduction to Programming 3
CS-150 Programming in C 3
CS-220 Database Management 3

Mathematics and Science 19 Credits
MA-112 Intermediate Alegbra 3
MA-114 Algebra and Trigonometry 4
MA-128 Introduction to Statistics 3
BUS-101 Introduction Data Science 3
CH-120 Chemistry 3
PH-201 General Physics I

Humanities and Social Science 15 Credits
HU-220 Critical Thinking 3
HU-225 Writing for the Internet 3
HU-331 Arts and Ideas 3
SS-171 Introduction to Psychology 3
SS-351 Ethics 3

English 6 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3

Technical Electives 18 Credits
Technical Elective 3
Technical Elective 3
Technical Elective 3
Technical Elective 3
Technical Elective 3
Technical Elective 3

Facilities Management and Critical Infrastructure (BS)

The Bachelor of Science in Facilities Management and Critical Infrastructure teaches students to manage a variety of facilities management projects. The program pairs facilities management and cybersecurity skills to prepare graduates to lead in the field. All students will complete a capstone course in which they propose, design, build and test a facilities management project.

Course Requirements
Bachelor of Science 121 Credits
Course Credits

Cybersecurity 12 Credits
CT-152 Introduction to Unix 3
IAE-201 Introduction to Cybersecurity 3
IAE-250 Comprehensive Computer and Network Security 3
IAE-321 Applied Wireless Network Security 3

Business 9 Credits
BUS-270 Financial Accounting I 3
BUS-283 Managerial Accounting 3
BUS-484 International Business 3

Critical Infrastructure 9 Credits
CRI-210 Critical Infrastructure I 3
CRI-310 Critical Infrastructure II 3
CRI-410 Critical Infrastructure III 3

Mathematics and Sciences 19 Credits
MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry 4
MA-128 Statistics 3
CH-120 Chemistry 3
PH-201 General Physics 3
UAS-101 Introduction to Unmanned and Autonomous Systems 3

Facilities Management 39 Credits
FM-120 Intro to Facilities Management 3
CM-125 Construction Graphics and Plan Reading 3
Technical Elective 3
CM-220 Construction Methods and Materials w/ lab to cover II 3
CM-230 Estimating I 3
CM-250 Legal Issues in Construction 3
FM-260 Facilities Management Leadership & Strategy 3
FM-280 Facilities Occupancy, Human Factors, Performance and Quality 3
FM-301 Facilities Project Management and Finance 3

FM-330 Building Operations and Maintenance 3
FM-350 Facility Information Management and Technology Management 3
CM-375 Mechanical and Electrical Systems 3
FM-380 Facilities Energy and Sustainability 3
FM-450 Principles of Real Estate 3
FM-460 Facilities Risk Management and Communication 3

Humanities, Social Science, Management 27 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
BUS-200 Business Communications 3
BUS-174 Intro to Business and Management 3
BUS-282 Foundations of Economics 3
HU-331 Arts and Ideas 3
SS-351 Ethics 3

Humanities Electives (3)* 3
Social Science Elective (3)* 3

Information Technology (BS)

The Bachelor of Science in Information Technology produces programmers who can design and develop the next generation of technology applications. In addition to specialized areas such as iPhone application development and JavaScript, students also learn the fundamentals of computer science, programming, and software design. All students will complete a capstone in which they propose, design, build, test and deliver a working software application.

Course Requirements
Bachelor of Science 121 Credits
Course Credits

Computer Science and Web 51 Credits
CS-130 Introduction to Programming Using Java 3
CS-150 Introduction to Programming in C 3
CS-220 Database Management 3
CS-225 Intermediate Java Programming 3
CS-230 Data Structures 3
NT-150 Computer Networking 3
CT-102 Introduction to Internet Applications 3
CT-152 Introduction to UNIX 3
CT-206 Scripting Languages 3
CT-376 JavaScript 3
CT-406 Web Programming Languages 3
IAE-201 Introduction to Information Assurance Concepts 3

IAE-250 Comprehensive Computer and Network Security 3
IAE-311 Mobile Computing Security 3
SE-321 Human Computer Interaction 3
SE-457 Senior Design Project I 3
SE-458 Senior Design Project II 3

Business 9 Credits
BUS-174 Introduction to Business Management 3
BUS-208 E-Commerce and the Law 3
BUS-289 Entrepreneurship/Small Business Management 3

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

Humanities and Social Sciences 27 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
HU-210 Game Design Theory 3
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Social Sciences or Management Electives 3
Social Sciences or Management Electives 3
Humanities Electives 3
Humanities Electives 3

Electives 18 Credits
General Elective 3
General Elective 3
General Elective 3
General Elective 3
General Elective 3
General Elective 3

Management of Cyber and Information Technology (BS)

The Bachelor of Science in Management of Cyber and Information Technology prepares students for positions in cybersecurity or business that use sophisticated information resources. The program produces systems thinkers with both management expertise and technical competence. Students learn about the demands of technical jobs and how to facilitate an efficient working environment. Students study the principles of management, organizational behavior, production, business telecommunications analysis and marketing. All students will complete a capstone course in which they propose, design, test and deliver a management project.

Course Requirements
Bachelor of Science 120 Credits
Course Credits

Business Fundamentals 18 Credits
BUS-174 Introduction to Business and Management 3
BUS-200 Business Communications 3
BUS-270 Financial Accounting I 3
BUS-275 Human Resource Management 3
BUS-280 Macroeconomics or BUS-281 Microeconomics 3
BUS-372 Financial Management 3

Business Administration 24 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-457 Senior Design Project I 3
BUS-458 Senior Design Project II 3

Information Technology 33 Credits
BUS-250 Database for Managers 3
BUS-362 Information Systems for Managers 3
CT-152 Introduction to UNIX 3
CS-130 Introduction to Programming Using Java 3
CS-150 Introduction to Programming in C 3
IAE-201 Introduction to Information Assurance Concepts 3
IAE-250 Comprehensive Computer and Network Security 3
IAE-260 Secure Systems Administration UNIX and Operation 3
IAE-325 Secure Data Communications Cryptography 3
IAE-402 Introduction to Incident Handling and Malicious Code 3
NT-100 Computer Architecture and Construction 3

Mathematics and Science 15 Credits
BUS-246 Business Research Methods 3
MA-110 Business Management Mathematics I 3
MA-111 Business Management Mathematics II 3
MA-128 Introduction to Statistics 3
Science Elective 3

Humanities and Social Sciences 18 Credits
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Humanities Electives 3
Humanities Electives 3
Social Science Electives 3
Social Science Electives 3

English Communications 6 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3

Electives 6 Credits
Technical Electives 3
Technical Electives 3

Mechatronics Engineering (BS)

The Bachelor of Science in Mechatronics Engineering enables students to become a professional in the multidisciplinary field. The program provides instruction and hands-on experience with mechanical systems, electronics, systems engineering and automation. Students study engineering mechanics, kinematics, fluid mechanics, instrumentation, circuit analysis, safety and power systems engineering. Graduates have the ability to work as part of a multidisciplinary team, combine different systems to develop a solution for a real-world problem, or design and build an integrated system.

Course Requirements
Bachelor of Science 120 Credits
Course Credits

Mechatronics 33 Credits
MEC-155 Intro to Materials Science 3
MEC-210 Engineering Mechanics - Statics 3
MEC-215 Intro to Engineering Design CAD 3
MEC-220 Principles of Mechatronics 3
MEC-310 Engineering Mechanics - Dynamics 3
MEC-330 Fluid Mechanics 3
MEC-370 Electronics and Instrumentation 3
MEC-375 Engineering Safety 3
MEC-410 Kinematics and Dynamics of Machinery 3
MEC-455 Mechatronics System Design 3
MEC-462 Automation Systems Design 3

Electronics and Engineering 27 Credits
EL-100 Intro to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices and Circuits 3
EL-204 Digital Electronics 3
EL-262 Microprocessors and Microassembly 3
EE-285 Programmable Logic Controllers and Networks 3
EE-340 Systems Engineering 3
EE-353 Power Systems Engineering 3
EE-453 Control I 3

Computer Science 6 Credits
CS-150 Programming in C 3
CS-200 Programming in C++ 3

Mathematics and Science 30 Credits
CH-120 Chemistry 3
MA-261 Calculus I 4
MA-262 Calculus II 4
MA-263 Calculus III 4
MA-340 Ordinary Differential Equations 3
PH-261 Engineering Physics I 4
PH-262 Engineering Physics II 4
PH-263 Engineering Physics III 4

Humanities, Social Sciences, and Management 24 Credits
BUS-301 Project Management 3
EN-101 English Communications I 3
EN-102 English Communications II 3
HU-331 Arts and Ideas 3
SS-351 Ethics 3
Social Science Elective 3
Humanities Electives 3
Humanities Electives 3

Mechatronics and Robotics Engineering Technology (BS)

The Bachelor of Science in Mechatronics and Robotics Engineering teaches students modeling methods, systems engineering and practical applications of mechatronics and robotics. The program produces engineers with the skills to create economic, reliable and simplified systems. Students gain a foundation in circuit design and analysis, systems and control engineering, and develop an understanding of complex mechatronic and robotics systems. Students complete courses in robotics systems engineering and analysis, digital electronics, control theory, power systems engineering, and automation systems design, which enable them to build and design integrated systems. All students will complete a capstone in which they propose, design, build, test and deliver a computer-based system.

Course Requirements
Bachelor of Science 122 Credits
Course Credits

Mechatronics 30 Credits
MEC-155 Introduction to Materials Science 3
MEC-210 Engineering Mechanics - Statics 3
MEC-215 Introduction to Engineering Design CAD 3
MEC-220 Principles of Mechatronics 3
MEC-310 Engineering Mechanics - Dynamics 3
MEC-370 Electronics and Instrumentation 3
MEC-375 Engineering Safety 3
MEC-410 Kinematics and Dynamics of Machinery 3
MEC-455 Mechatronic System Design 3
MEC-462 Automation Systems Design 3

Robotics 12 Credits
ROB-100 Introduction to Robotics 3
ROB-200 Robotics Systems Engineering and Analysis 3
ROB-300 Industrial Robotics 3
ROB-382 Robotics Systems 3

Electronics and Engineering 27 Credits
EL-100 Introduction to DC/AC Circuits 3
EL-150 DC/AC Circuits and Analysis 3
EL-200 Electronic Devices and Circuits 3
EL-204 Digital Electronics 3
EL-262 Microprocessors and Assembly 3
EE-285 Programmable Logic Controllers and Networks 3
EE-340 Systems Engineering 3
EE-353 Power Systems Engineering 3
EE-453 Control I 3

Computer Science 6 Credits
CS-150 Programming in C 3
CS-200 Programming Using C++ 3

Mathematics and Science 32 Credits
CH-120 Chemistry 3
MA-112 Intermediate Algebra 3
MA-114 Algebra and Trigonometry 4

MA-128 Introduction to Statistics 3
MA-261 Calculus I 4
MA-262 Calculus II 4
MA-340 Ordinary Differential Equations 3
PH-261 Engineering Physics I 4
PH-262 Engineering Physics II 4

Humanities, Social Sciences, and Management 15 Credits
BUS-301 Project Management 3
EN-101 English Communications I 3
EN-102 English Communications II 3
HU-331 Arts and Ideas 3
SS-351 Ethics 3

Professional Trades Administration (BS)

The BS in Professional Trades Administration degree focuses on developing business skills for individuals working the industrial trades who want to start and manage their own businesses. This program introduces the analytics and decision making for successful skilled professionals that either want to complete a bachelors' degree or gain skills leading to opening their own business. Business courses such as accounting, finance, human resource, legal issues, project management, business writing, and more will provide a solid foundation for those wishing to expand on their expertise in addition to trade skill. This degree is transfer credit friendly which will be excellent for those who have completed technical courses such as NCCER Certification, community college applied technical courses, and accredited apprenticeship programs and want to leverage that training to help earn a bachelor's degree.

Course Requirements

Bachelor of Science 121 Credits

Course Credits

Business and Management 39 Credits
BUS-174 Introduction to Business Management
BUS-200 Business Communications
BUS-270 Financial Accounting I 3
BUS-275 Human Resource Management 3
BUS-279 Introduction to Leadership 3
BUS-282 Foundations of Economics
BUS-289 Entrepreneurship and Small Business Management 3
BUS-301 Project Management 3
BUS-372 Financial Management 3
BUS-376 Marketing Principles 3
BUS-378 Legal Environment of Business 3

BUS-454 International Business 3
SAF-402 Construction Safety Management 3

Mathematics & Data Science 19 Credits
MA-112 Intermediate Algebra 3
MA-114 Algebra & Trigonometry 4
MA-128 Introduction to Statistics 3
BUS-101 Introduction to Data Science 3
CH-120 Chemistry 3
PH-201 General Physics I 3

Electives 42 Credits
Technical Elective (CM-120, FM-120, INT-101, or NT-150) 3
Technical Elective (CM-125, CT-152, or CRT-101) 3
Technical Elective (IAE-201, SAF-120, SAF-214, CM-220, or CRT-201) 3
Technical Elective (CS-220, CM-250, or CRT-202) 3
Technical Elective (CS-230, SAF-300, CM-270, or CRT-203) 3
Technical Elective (CM-230, CS-120, CS-220, CS-230, SAF-318, or SAF-304) 3
Technical Elective (UAS-101, CM-260, IAE-321, or IAS-250) 3
Technical Elective (IAE 402, CM-350, FM-350, or IAS-311) 3
Technical Elective (IAE-390, CM-380, or SAF-400) 3
Technical Elective (IAE-325, SAF-402, or CRI-310) 3
Technical Elective (CRI-410 or SAF-414) 3
Technical Elective (IAE-406 or CRT-401) 3
Technical Elective (CRT-302 or SAF-416) 3
Technical Elective (IAE-406 or CRT-401) 3

Humanities and Social Sciences 21 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
HU-220 Critical Thinking 3
HU-225 Writing for the Internet 3
HU-331 Arts and Ideas 3
SS-171 Introduction to Psychology 3
SS-351 Ethics 3

Software Engineering (BS)

The Bachelor of Science in Software Engineering teaches students to design and program computers and computer-based systems. The program produces practical software engineers who can analyze and determine the needs of a system and apply engineering principles to create software and hardware solutions. Students study modern programming languages, algorithm development, software design and testing, as well as computer organization and architecture, micro-controller system design, programmable chip technology, and knowledge acquisition using UML. All students will complete a capstone in which they propose, design, build, test and deliver a working software application.

Course Requirements

Bachelor of Science 120 Credits

Course Credits

Technical Pre-requisites 6 Credits
EL-204 Digital Electronics 3
EL-262 Microprocessors and Microassembly 3

Programming and Computer Science 39 Credits
CS-130 Introduction to Programming Using Java 3
CS-150 Introduction to Programming in C 3
CS-200 Programming in C++ 3
CS-250 Introduction to Network Programming with C 3 ***OR*** CS-356 Dynamic Web Page Development 3 ***OR*** CS-406 Web Programming Languages 3
CS-220 Database Management 3
CS-225 Intermediate Java Programming 3
CS-230 Data Structures 3
CS-310 Computer Algorithms 3
CS-330 iPhone App Development 3 ***OR*** CS-305 Android App Development 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

Engineering 21 Credits
SE-351 Software Testing 3
CT-406 Requirements/Resource Analysis 3
CS-452 Agile Methods 3
SE-321 Human Computer Interaction 3
SE-457 Senior Design Project I 3
SE-458 Senior Design Project II 3
Software Elective 3

Mathematics and Science 30 Credits
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

Math or Science Elective 3
Math or Science Elective 3

Humanities and Social Sciences 18 Credits
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Social Science Electives 3
Social Science Electives 3
Humanities Electives 3
Humanities Electives 3

English Communications 6 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3

Technology and Business Management (BS)

The Bachelor of Science in Technology and Business Management provides students with the skills needed to make sound business decisions. The program enables students to gain an understanding of how organizations operate. Students learn how functional business areas work together to achieve success in a global environment. Topics include marketing, accounting, finance, information technology, and human resource management. All students will complete a capstone in which they propose, design and test a technology-based system.

Course Requirements
Bachelor of Science 120 Credits
Course Credits

Business Fundamentals 27 Credits
BUS-174 Introduction to Business and Management 3
BUS-270 Financial Accounting I 3
BUS-271 Financial Accounting II 3
BUS-275 Human Resource Management 3
BUS-279 Introduction to Leadership 3
BUS-280 Macroeconomics 3
BUS-281 Microeconomics 3
BUS-283 Managerial Accounting 3
BUS-372 Financial Management 3

Business Administration 24 Credits
BUS-376 Marketing Principles 3
BUS-378 Legal Environment 3
BUS-384 Production and Operations Management 3
BUS-386 Organizational Theory and Behavior 3
BUS-410 Strategic Management 3

BUS-454 International Business 3
BUS-457 Senior Design Project I 3
BUS-458 Senior Design Project II 3

Information Technology 12 Credits
BUS-250 Database for Managers 3
BUS-301 Project Management 3
BUS-362 Information Systems for Managers 3
IAE-201 Introduction to Information Assurance 3

Mathematics and Science 15 Credits
BUS-246 Business Research Methods 3
MA-110 Business Management Math I 3
MA-111Business Management Math II 3
MA-128 Introduction to Statistics 3
Science Elective 3

Humanities and Social Sciences 18 Credits
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Humanities Electives 3
Humanities Electives 3
Social Science Electives 3
Social Science Electives 3

English Communications 9 Credits
EN-101 English Communications I 3
EN-102 English Communications II 3
BUS-200 Business Communications 3

Electives 15 Credits
Technical Elective 3
Technical Elective 3
Technical Elective 3
Technical Elective 3
Technical Elective 3

Unmanned and Autonomous Systems (BS)

The Bachelor of Science in Unmanned and Autonomous Systems provides students with the necessary knowledge to become a professional in the field. The program provides a foundation in flight operations, mission planning, special sensors, weapons, surveillance and data collection, aeronautical technologies and ground control. Students design, construct, and fly an Unmanned Aerial Vehicle (UAV). Students can become certified Unmanned Aerial Systems Operators, and gain the knowledge and skills to support governmental and commercial employers. The program prepares students to pass the Federal Aviation Administration (FAA) Part 107 test to become a Commercial UAV Pilot and Sport Pilot. All students will complete a capstone in which they propose, design, build, test and deliver a computer-based system.

Course Requirements
Bachelor of Science 122 Credits
Course Credits

Unmanned and Autonomous Systems (UAS) -Technical Core 46 Credits
UAS-101 Introduction to UAS 3
UAS-102 Mechanics of UAS 3
EL-100 Introduction to DC/AC Circuits 3
UAS-110 Air Traffic Control Communications 3
UAS-120 UAS Operator Certification 4
UAS-130 UAS Safety Management Systems 3
UAS-140 UAS Operations 3
UAS-150 UAS Crew Planning 3
UAS-201 UAS Sensors 3
UAS-202 UAS Ground Vehicles 3
UAS-210 UAS Design 3
UAS-220 Introduction to Processing Remotely Sensed Data 3
UAS-230 Unmanned Surface and Underwater Vehicles 3
UAS-240 Unmanned Space Vehicles 3
UAS-250 Unmanned Vehicle Environments 3

Unmanned and Autonomous Systems - Management Core 18 Credits
UAS-310 Unmanned Vehicle Missions 3
UAS-320 Unmanned Vehicle Business Decisions 3
UAS-330 Unmanned Systems Crew Resource Management 3
UAS-410 Unmanned Vehicle Laws and Regulations 3
UAS-457 Senior Design Project I 3
UAS-458 Senior Design Project II 3

Unmanned and Autonomous Systems - Data Core 18 Credits
CS-150 Introduction to Programming in C 3
CS-220 Database Management 3
CT-206 Scripting Languages 3
IAE-201 Introduction to Information Assurance Concepts 3
UAS-420 Data Acquisition and Post-Processing 3
UAS-430 UAS Data Visualization and Presentation 3

English, Humanities, and Social Sciences 21 Credits
EN-101 English Communications I 3

EN-102 English Communications II 3
HU-331 or HU-332 Arts and Ideas 3
SS-351 Ethics 3
Social Science Elective 3
Humanities Elective 3
Humanities Elective 3

Mathematics and Physical Sciences 19 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
AE-390 Aviation Meteorology 3

Minors

Undergraduate minors enable students to add a concentration to their academic credentials. Students seeking an undergraduate minor must have earned at least 15 credits in residence at Capitol Technology University, with a cumulative GPA of 2.0 or higher before declaring a minor. Once students have earned more than 100 credits, they are no longer eligible to declare a minor. A student may only have one declared minor. No course substitutions are permitted. No more than nine transfer credits may be applied to a minor, and no more than six credits may apply to both a major degree program and a minor.

Computer Science (18 credits)

Computer science minors learn the basics of programming, using two languages: Java and C, as well as database management, algorithms, data structures and analytical skills used by industry professionals.

Required Courses
CS-130 Introduction to Programming Using Java 3
CS-150 Programming in C 3
CS-220 Database Management 3
CS-230 Data Structures 3
CS-310 Computer Algorithms 3
CS-316 Intelligent Systems 3

Due to the similar nature of required courses, students in Computer Engineering and Computer Sciences majors will not be eligible to apply for this minor.

Cybersecurity (18 credits)

Cybersecurity minors learn the basics of information security, as well as essential

Undergraduate Studies

systems administration skills used by industry professionals. Additional topics include network security, secure communication and cryptography, and incident handling.

Required Courses
NT-150 Computer Networking 3
IAE-201 Introduction to Information Assurance Concepts 3
IAE-250 Comprehensive Computer and Network Security 3
IAE-260 Secure Systems Administration and Operation 3
IAE-325 Secure Data Communications and Cryptography 3
IAE-402 Introduction to Incident Handling and Malicious Code 3

Due to the similar nature of required courses, cybersecurity majors are not eligible to apply for this minor.

Esports and Gaming Administration (21 credits)

GDV-101 Introduction to Games* 3
EGA-120 Introduction to Esports Management* 3
BUS-174 Intro to Business and Management 3
BUS-301 Project Management 3
EGA-340 Convention, Event and Trade Show Planning* 3
BUS-376 Marketing Principles 3
EGA-421 Distribution of Games: The Role of the Publisher* 3

Courses are 15-week taken through RIZE Consortium (Live online or Asynchronous)

Game Development (18 credits)

GDV-101 Introduction to Games* 3
CS-120 Intro to Programming Using Python 3
CS-150 Intro to Programming Using C 3
HU-210 Game Design and Theory 3
GDV-230 Game Engines I: Working with Unity* 3
GDV-410 Game Engines II: Advanced Unity* 3

Courses are 15-week taken through RIZE Consortium (Live online or Asynchronous)

Unmanned and Autonomous Systems (22 credits)

Unmanned systems minors gain a foundation in the field, including an understanding of the essential rules and regulations upheld by industry professionals. Students explore vehicle missions, learn how businesses make decisions, and obtain an operator certification.

Required Courses
UAS-101 Introduction to Unmanned and Autonomous Systems 3
UAS-102 Mechanics of Unmanned and Autonomous Systems 3

UAS-120 Unmanned and Autonomous Systems Operator Certification 4
UAS-140 Unmanned and Autonomous Systems Operations 3
UAS-310 Unmanned Vehicle Missions 3
UAS-320 Unmanned Vehicle Business Decisions 3
UAS-410 Unmanned Vehicle Laws and Regulations 3

Due to the similar nature of required courses, unmanned and autonomous systems majors are not eligible to apply for this minor.

Undergraduate Certificates

Undergraduate certificates are targeted at distinct information technology and management fields. Students seeking an undergraduate certificate may only apply one relevant transfer course to certificate requirements. No course substitutions are permitted and students must complete all remaining coursework at Capitol Technology University. 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 2.0 in all certificate coursework to be awarded a certificate.

For descriptions of required courses, see listing beginning on page 152.

Acquisitions Management (12 credits)

This upper-level certificate provide students with strategies to make sound business decisions. Major topics include the foundations of pricing, negotiations, contracting, procurement, 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 (12 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-120 Introduction to Programming using Python 3

IAE-201 Introduction to Information Assurance Concepts 3
IAE-250 Comprehensive Computer and Network Security 3
IAE-260 Secure Systems Administration and Operation 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 enables students to learn the basic concepts and strategies of project management for government and private industry.

Required Courses

BUS-275 Human Resource Management 3
BUS-301 Project Management 3
BUS-302 Methods of IT Project Management 3
BUS-303 Project Management Competitive Advantage 3

Programming and Data Management (12 credits)

This lower-level certificate provides students with an understanding of how programmers store and manage computer data. Students learn the object-oriented paradigm and the fundamental aspects of the storage and management of computer data. Topics covered include Python, Java, Oracle and advanced data structures.

Required Courses

CS-120 Intro to Programming Using Python 3
CS-130 Intro to Programming Using Java 3
CS-220 Database Management 3
CS-225 Intermediate Java Programming 3

Software Engineering (12 credits)

In this upper-level certificate, students learn about data structures and data mining, as well as the methods and methodologies involved in analyzing, designing and implementing reliable computer applications.

Required Courses

CS-230 Data Structures 3
CS-240 Introduction to Data Mining 3
CS-405 Introduction to Software Design with Unified Modeling Language 3
CS-452 Agile Methods for Software Engineering 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 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

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 a foundation in programming, with a focus on transactions conducted over the Internet. Students learn about the web and the basic tools used for webpage construction, including HTML, DHTML, scripting, CSS and XML. Topics covered include relational databases, programming techniques and tools needed to create dynamic webpages.

Required Courses
CT-102 Introduction to Internet Applications 3
CT-206 Scripting Languages 3
CT-376 JavaScript 3
CT-406 Web Programming Languages 3

Website Development (12 credits)

This 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. Topics covered include website and browser requirements, platform selection, web server functions, client and server-side applications, cookies, and website security.

Required Courses
CT-152 Introduction to UNIX 3
CS-130 Introduction to Programming Using Java 3
CS-220 Database Management 3
CT-376 Javascript 3

Graduate Studies

Graduate Program Offerings

Doctor of Philosophy (PhD) Degree

- Artificial Intelligence
- Aeronautical Science
- Aviation
- Business Analytics and Data Science
- Construction Science
- Counterterrorism
- Critical Infrastructure
- Cyberpsychology
- Cybersecurity Leadership
- Emergency and Protective Services
- Facilities Management
- Financial Cybersecurity
- Healthcare Cybersecurity
- Human Factors
- Manufacturing
- Occupational Health and Safety
- Operational Technology
- Product Management
- Quantum Computing
- Real Estate Management
- Space Cybersecurity
- Technology
- Technology Combination Program (MS/PhD)
- Unmanned Systems Applications

Doctor of Science (DSc) Degree

- Cybersecurity

The Technology and Unmanned Systems Applications doctoral programs are all asynchronous and have no residency requirements. Students research a topic and submit a thesis or meet a publication requirement. All other doctoral classes are taught in real-time, accelerated 8-week classes except for three residency courses that are held on campus over three weekends.

Master of Business Administration (MBA) Degree

- Business Administration
- Technical Master of Business Administration in Business Analytics and Data Science
- Technical Master of Business Administration in Cybersecurity

Master of Science (MS) Degrees

- Aviation
- Aviation Cybersecurity
- Computer Science

- Construction Cybersecurity
- Construction Safety
- Counterterrorism
- Critical Infrastructure
- Cyber Analytics
- Cybersecurity
- Engineering Technology
- Product Management
- Unmanned and Autonomous Systems Policy and Risk Management

Master of Research (M.Res.) Degrees

- Aviation Maintenance
- Cyberpsychology
- Sustainability

Post-Baccalaureate Certificates

- Information Technology
- Healthcare Systems Security
- Security Management
- Secure Cloud Computing
- Secure Mobile Technology

Doctoral Admissions

Requirements

Cybersecurity (DSc)

- Master's degree in information assurance, computer science, information technology or related field from a regionally accredited college or university
- Minimum of three to five years of directly related work experience
- Two letters of recommendation
- Currently hold one of the following industry certifications: CISSP, GSE, CGEIT or CISM. Students who hold other senior level certificates will be reviewed on a case-by-case basis.

All PhD Programs

- Master's degree in a relevant field from an accredited college or university
- A resume showing a minimum of 3-5 years of directly related work experience
- Two letters of recommendation

Technology Combination Program (MS/PhD)

- Bachelor's degree in a relevant field from an accredited college or university
- A resume showing related work experience

- Two letters of recommendation
- Without a master’s degree, work experience considered in lieu of qualifications and reviewed under state rule for suitability.

Doctoral Application Deadlines

Start	Application Deadline
Fall	Aug. 15 (classes start early Sept.)
Spring	Dec. 1 (classes start early Jan.)
Summer	April 2 (classes start Early May)

Once an applicant’s file is complete, it will be sent to the Admissions Committee for review. Applicant qualifications will be reviewed individually, and an interview may be required. Applications are reviewed on a rolling basis. Applicants will be notified of their acceptance status via email.

Aeronautical Science (PhD)

The Doctor of Philosophy in Aeronautical Science is designed to meet the demands for the highest skilled professionals to become the leaders who will be involved in the advancement, expansion, and support of commercial, military, or private aviation. Graduates will contribute significantly to the aviation field through the creation of new knowledge and ideas. They will contribute to the body of knowledge at a critical point, as the entire sector expands and incorporates increasing technology. Students who complete the program can expect to fill executive and senior-level management positions in commercial, military, logistics, manufacturing, and operations.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits
AVT-800 Aeronautical Science Research Background 6
AVT-810 Aeronautical Science Research Methodologies 6
AVT-820 Aeronautical Science Future Demand 6
AVT-830 Strategies for Aeronautical Science 6
AVT-840 Aeronautical Science Research Proposal 6
AVT-900 Aeronautical Science Doctoral Writing I 6
AVT-910 Aeronautical Science Doctoral Writing II 6
AVT-920 Aeronautical Science Doctoral Writing III 6
AVT-930 Aeronautical Science Doctoral Writing IV 6
AVT-940 Aeronautical Science Doctoral Defense 6
All required courses are offered exclusively online in an 16-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Artificial Intelligence (PhD)

The Doctor of Philosophy in Artificial Intelligence provides students with the opportunity to conduct extensive and original research at the highest level in the field. This unique Doctoral Program is designed to meet the demands of the highest skilled professional to become a leader who is involved in the advancement, expansion, and support of the Artificial Intelligence industry. The degree provides a path for Artificial Intelligence personnel to create intelligent machines that think, learn, and work like humans in all areas of our lives. Artificial Intelligence is an interdisciplinary field that includes a wide range of disciplines including aerospace, defense, engineering, robotics, and mechatronics. Graduates leave the program with skills necessary to work interdisciplinary environment.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

AIT-800 Artificial Intelligence Research Background 6
AIT-810 Artificial Intelligence Research Methodologies 6
AIT-820 Artificial Intelligence Future Demands 6
AIT-830 Strategies for Artificial Intelligence 6
AIT-840 Artificial Intelligence Research Proposal 6
AIT-900 Artificial Intelligence Doctoral Writing I 6
AIT-910 Artificial Intelligence Doctoral Writing II 6
AIT-920 Artificial Intelligence Doctoral Writing III 6
AIT-930 Artificial Intelligence Doctoral Writing IV 6
AIT-940 Artificial Intelligence Doctoral Defense 6

Business Analytics and Data Science (PhD)

The Doctor of Philosophy in Business Analytics and Data Science is designed to prepare accomplished professionals for senior positions in either public or private sectors. The program enables professionals from the field to understand and evaluate the scope and impact of decision sciences and associated technology from both institutional and industry perspectives. The program will provide doctoral level research experience allowing innovative and practical contributions to the management and data science body of knowledge.

Course Sequence of Study
Doctor of Philosophy 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 (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 3
(Term One)
DSM-920 Big Data Warehousing and Analytic Systems 3
(Term Two)

Second Semester
RSC-826 Applied Research in Management and Decision Sciences 3
(Term One)
DSR-951 Dissertation Research I 3
(Term Two)
Third Semester
PHL-813 Professional Ethics and Leadership (Term One) 3
RSC-815 Problem-Solving and Decision-Making Using Quantitative Methods (Term Two) 3
DSR-930 Management and Security of Information (Residency) 3

YEAR 3
First Semester
DSR-952 Dissertation Research II (Term One) 3
DSR-953 Dissertation Research III (Term Two) 3
Second Semester
DSR-945 Dissertation Preparation I (Term One) 3
DSR-960 Dissertation Presentation and Oral Defense (Residency) 3

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Computer Science (PhD)

The Doctor of Philosophy in Computer Science provides students with the opportunity to conduct extensive and sustained original research at the highest level in the field of operational technology. Computer Science (CS) is a multifaceted discipline. CS is the hardware and software that detects or causes a change, through the direct monitoring and control of industrial equipment, assets, processes, and events. CS is also the technology that interfaces with the physical world, including Industrial Control Systems (ICS), Supervisory Control and Data Acquisition (SCADA) Distributed Control Systems (DCS), and the Internet of Things (IoT). The PhD in Computer Science is a unique doctoral program designed to meet the demands of the highest skilled professionals to become the leaders who will be involved in the advancement, expansion, and support of the Computer Science industry. Computer Science has existed since the discovered ability to use and store business data with machines and electricity has powered machinery and equipment in factories, buildings, transportation, systems, the utility industry, and more. However, the accelerating convergence of CS with Information Technology (IT) has made CS one of the most rapidly growing fields, permeating all sectors of our lives, work, and national security. As a result, the field requires innovative researchers and practitioners who desire to elevate their skills to the highest level and contribute to the body of knowledge in Computer Science.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

CS-800 Operational Technology Research Background
CS-810 Operational Technology Research Methodologies
CS-820 Operational Technology Future Demands
CS-830 Operational Technology
CS-840 Operational Technology Research Proposal
CS-900 Operational Technology Doctoral Writing I
CS-910 Operational Technology Doctoral Writing II
CS-920 Operational Technology Doctoral Writing III
CS-930 Operational Technology Doctoral Writing IV
CS-940 Operational Technology Doctoral Defense

Construction Science (PhD)

The Doctor of Philosophy in Construction Science is designed to meet the demands of the highest skilled professionals to become the leaders who support, advance, and expand construction science on both large and small scales. This program provides a path for professionals in the construction field to explore new ground, as the industry faces changes in competitive local, national, and global markets. Graduates will contribute to the construction science field through the creation of new ideas in response to the impact of increasing technology. Students who complete the program can expect to fill executive and senior-level management positions in commercial construction, military construction, civil construction, and construction technology.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

CM-800 Construction Science Research Background 6
CM-810 Construction Science Research Methodologies 6
CM-820 Construction Science Future Demands 6
CM-830 Strategies for Construction Science 6
CM-840 Construction Science Research Proposal 6

CM-900 Construction Science Doctoral Writing I 6
CM-910 Construction Science Doctoral Writing II 6
CM-920 Construction Science Doctoral Writing III 6
CM-930 Construction Science Doctoral Writing IV 6
CM-940 Construction Science Doctoral Defense 6

All required courses are offered exclusively online in an 16-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Counterterrorism (PhD)

The Doctor of Philosophy (Ph.D.) in Counterterrorism degree is a unique program designed to meet the long-standing needs of today's business and government environments for combatting terrorism. The Ph.D. in Counterterrorism program provides students with the opportunity to conduct extensive and sustained, original research at the highest level in the field of counterterrorism. The Ph.D. in Counterterrorism is designed to meet the demands of the highest-skilled professionals to become leaders who will be involved in the advancement, expansion and support of the counterterrorism environment on a large and small scale. The Ph.D. in Counterterrorism is for current professionals in the field who desire to elevate their skills to the highest level and to contribute to the body of knowledge in counterterrorism.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits
CRT-800 Counterterrorism Research Background (6 Credits)
CRT-810 Counterterrorism Research Methodologies (6 Credits)
CRT-820 Counterterrorism Future Demands (6 Credits)
CRT-830 Strategies for Counterterrorism (6 Credits)
CRT-840 Counterterrorism Research Proposal (6 Credits)
CRT-900 Counterterrorism Doctoral Writing I (6 Credits)
CRT-910 Counterterrorism Doctoral Writing II (6 Credits)
CRT-920 Counterterrorism Doctoral Writing III (6 Credits)
CRT-930 Counterterrorism Doctoral Writing IV (6 Credits)
CRT-940 Counterterrorism Doctoral Defense (6 Credits)

Critical Infrastructure (PhD)

The Doctor of Philosophy in Critical Infrastructure is designed to meet the demand for the highest skilled professionals to become the leaders who direct and upgrade the nation's critical infrastructure. The program addresses one of the greatest technical challenges of the 21st century: how to create a robust and sustainable infrastructure that is resilient against multiple threats, as well as how to build operational, systems, and programmatic capabilities for detection, protection, prevention, mitigation, and response. Graduates can expect to fill executive and senior-level management positions in government organizations, private corporations, and commercial start-up companies.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

CRI-800 Critical Infrastructure Nervous System 6
CRI-810 Critical Infrastructure Construction and Function 6
CRI-820 Threats to Critical Infrastructure 6
CRI-830 Strategies for Critical Infrastructure Protection and Resilience 6
CRI-850 Critical Infrastructure Path Forward 6
CRI-900 Critical Infrastructure Doctoral Writing I 6
CRI-910 Critical Infrastructure Doctoral Writing II 6
CRI-920 Critical Infrastructure Doctoral Writing III 6
CRI-930 Critical Infrastructure Doctoral Writing IV 6
CRI-940 Critical Infrastructure Doctoral Defense 6

All required courses are offered exclusively online. For descriptions of required courses, see listing beginning on page 152.

Cyberpsychology (PhD)

The Doctor of Philosophy (Ph.D.) in Cyberpsychology degree is a unique program designed to meet the rapidly evolving needs of an ever-changing world of conflict within the cyber-sphere. The Ph.D. in Cyberpsychology program provides students with the opportunity to conduct extensive and sustained, original research at the highest level in the field of Cyberpsychology. The Ph.D. in Cyberpsychology is designed to meet the demands of the highest-skilled professionals to become leaders who will be involved in the advancement, expansion, and support of Cyberpsychology on a national and international level. The Ph.D. in Cyberpsychology is for current professionals in the field who desire to elevate their skills to the highest level and to contribute to the body of knowledge in Cyberpsychology.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

CPY-800 Cyberpsychology Research Background 6
CPY-810 Cyberpsychology Research Methodologies 6
CPY-820 Cyberpsychology Future Demands 6
CPY-830 Strategies for Cyberpsychology 6
CPY-840 Cyberpsychology Research Proposal 6
CPY-900 Cyberpsychology Doctoral Writing I 6
CPY-910 Cyberpsychology Doctoral Writing II 6
CPY-920 Cyberpsychology Doctoral Writing III 6
CPY-930 Cyberpsychology Doctoral Writing IV 6
CPY-940 Cyberpsychology Doctoral Defense 6

Cybersecurity (DSc)

The Doctor of Science in Cybersecurity prepares students for the rigors of cybersecurity in federal agencies and industry, and results in graduates who are prepared to lead the field's top organizations. The program, which balances theory and hands-on application, enables students to develop high-level critical thinking and leadership and technical skills, as well as research experience. Graduates are prepared to lead local, national and global organizations and provide expert guidance for the protection of information assets.

Course Sequence of Study
Doctor of Science 54 Credits
Course Credits

YEAR 1
First Semester
RSC-802 Fundamentals of Doctoral Learning 6
(Sixteen-week Course)
Second Semester
IAE-830 Information Assurance Research Literature (Term One) 3
RSC-810 Professional Research Theory and Practice I (Term Two) 3
RSC-820 Situation Awareness Analysis and Action Plan Processes (Residency) 3
Third Semester
RSC-825 Applied Research in Information Assurance (Term One) 3
RSC-813 Professional Ethics and Leadership (Term Two) 3

YEAR 2
First Semester
RSC-860 Research Design (Term One) 3
IAE-881 Special Topics II in Information Assurance (Term Two) 3
Second Semester
RSC-812 Professional Research Theory and Practice II (Term One) 3
IAE-880 Special Topics in Information Assurance (Term Two) 3
DSR-925 Dissertation Preparation (Residency) 3
Third Semester
IAE-882 Special Topics III in Information Assurance (Term One) 3
IAE-883 Special Topics IV in Information Assurance (Term Two) 3

YEAR 3
First Semester
DSR-900 Writing the Doctoral Dissertation (Term One) 3
IAE-884 Special Topics V in Information Assurance (Term Two) 3
Second Semester
DSR-935 Dissertation Preparation (Term One) 3
DSR-950 Dissertation Preparation and Oral Defense (Residency) 3

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Cybersecurity Leadership (PhD)

The Doctor of Philosophy in Cybersecurity Leadership provides students with the opportunity to conduct extensive and sustained original research at the highest level in the field. This degree provides a path for Cybersecurity Leadership personnel to explore new ground in the rapidly growing field. Graduates will contribute significantly to the field of Cybersecurity Leadership through the creation of new knowledge and ideas. The Ph.D. in Cybersecurity Leadership program is structured for experienced professionals in the field Cybersecurity Leadership who hold the appropriate master's degree and professional experience. This is a unique Doctoral Program designed to meet the demands of the highest skilled professional to become leaders who will be involved in the advancement, expansion and support of the Cybersecurity industry.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

CSL-800 Cybersecurity Leadership Research Background 6
CSL-810 Cybersecurity Leadership Research Methodologies 6
CSL-820 Cybersecurity Leadership Future Demands 6
CSL-830 Strategies for Cybersecurity Leadership 6
CSL-840 Cybersecurity Leadership Research Proposal 6
CSL-900 Cybersecurity Leadership Writing I 6
CSL-910 Cybersecurity Leadership Doctoral Writing II 6
CSL-920 Cybersecurity Leadership Doctoral Writing III 6
CSL-930 Cybersecurity Leadership Doctoral Writing IV 6
CSL-940 Cybersecurity Leadership Doctoral Defense 6

Emergency and Protective Services (PhD)

The Doctor of Philosophy in Emergency and Protective Services is designed to provide students with the opportunity to conduct extensive and sustained original research in the field. This degree is for current professionals in the field who desire to elevate their skills, and critical decision making to the highest level, and contribute to the body of knowledge in Emergency and Protective Services. This program provides a compass for Emergency and Protective Services personnel to explore new opportunities and obligations in the rapidly changing environment at the local, state, national, and global levels. Graduates contribute significantly to the Emergency

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

EPS-800 Emergency and Protective Services 6

EPS-810 Impending Environments in Emergency and Protective Services 6
EPS-820 Advanced Research Methodologies for Emergency and Protective Services 6
EPS-830 Comprehensive Strategies for Emergency and Protective Services 6
EPS-840 Emergency and Protective Services Proposal
EPS-900 Emergency and Protective Services Writing I 6
EPS-910 Emergency and Protective Services Writing II 6
EPS-920 Emergency and Protective Services Writing III 6
EPS-930 Emergency and Protective Services Writing IV 6
EPS-940 Emergency and Protective Services Defense 6

Facilities Management (PhD)

The PhD in Facilities Management will meet the demands of the highest-skilled professionals to become leaders who will be involved in the advancement, expansion, and support of Facilities Management. This degree is research focused and allows experts in the field to apply their skills to academic problems and advance the subject on the national and international stage. Facilities Management is now more demanding as technology and operational demands become integrated with work.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

FMT-800 Faciliites Management Research Background 6
FMT-810 Faciliites Management Research Methodologies 6
FMT-820 Faciliites Management Future Demands 6
FMT-830 Faciliites Management 6
FMT-840 Faciliites Management Research Proposal 6
FMT-900 Faciliites Management Doctoral Writing I 6
FMT-910 Faciliites Management Doctoral Writing II 6
FMT-920 Faciliites Management Doctoral Writing III 6
FMT-930 Faciliites Management Doctoral Writing IV 6
FMT-940 Faciliites Management Doctoral Defense 6

Financial Cybersecurity (PhD)

Financial Cybersecurity in an ever-changing world where operating efficiently, effectively and to maintain Financial Services success both in America and its outreach. It is not an extension of management studied but a discipline of Financial Cybersecurity. The PhD in Financial Cybersecurity program provides students with the opportunity to conduct extensive and sustained, original research at the highest level in the field of Financial Services, Data Analysis & Cybersecurity. The PhD in Financial Cybersecurity is for current leaders in the field who desire to elevate their skills to the highest level and to contribute to the body of knowledge in Financial Services, Data Analysis & Cybersecurity for the benefit of organizations and the Nation.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

FCS-800 Financial Cybersecurity Research Background 6
FCS-810 Financial Cybersecurity Research Methodologies 6
FCS-820 Financial Cybersecurity Future Demands 6
FCS-830 Financial Cybersecurity 6
FCS-840 Financial Cybersecurity Research Proposal 6
FCS-900 Financial Cybersecurity Doctoral Writing I 6
FCS-910 Financial Cybersecurity Doctoral Writing II 6
FCS-920 Financial Cybersecurity Doctoral Writing III 6
FCS-930 Financial Cybersecurity Doctoral Writing IV 6
FCS-940 Financial Cybersecurity Doctoral Defense 6

Healthcare Cybersecurity (PhD)

The Doctor of Philosophy in Healthcare Cybersecurity degree is a unique program designed to meet the long-standing needs of today's United States Healthcare Cybersecurity in an ever-changing world of risks to the Nation and individuals. Ransomware and trends in patient care need to be modelled and managed. Capitol Technology University is uniquely place academically to offer this degree with its geographical location, location on Institutes and Agencies that are dedicated to supporting and protecting this industry. The PhD in Healthcare and Cybersecurity program provides students with the opportunity to conduct extensive and sustained, original research at the highest level in the field of Healthcare Cybersecurity. The PhD in Healthcare Cybersecurity is for current leaders in the field who desire to elevate their skills to the highest level and to contribute to the body of knowledge in Healthcare Cybersecurity for the benefit of organizations and the Nation.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

HSC-800 Healthcare Cybersecurity Research Background 6
HSC-810 Healthcare Cybersecurity Research Methodologies 6
HSC-820 Healthcare Cybersecurity Future Demands 6
HSC-830 Healthcare Cybersecurity 6
HSC-840 Healthcare Cybersecurity Research Proposal 6
HSC-900 Healthcare Cybersecurity Doctoral Writing I 6
HSC-910 Healthcare Cybersecurity Doctoral Writing II 6
HSC-920 Healthcare Cybersecurity Doctoral Writing III 6
HSC-930 Healthcare Cybersecurity Doctoral Writing IV 6
HSC-940 Healthcare Cybersecurity Doctoral Defense 6

Human Factors (PhD)

The Doctor of Philosophy in Human Factors is designed to provide students with the opportunity to conduct extensive and sustained original research at the highest level in the field. This program trains students to become leaders who will be involved in the advancement, expansion, and support of the human factors industry. This degree is for current professionals who desire to elevate their skills to the highest level, and contribute to the body of knowledge in Human Factors. This discipline involves human centered designs for most of the products we use in society. Human Factors is one of the most rapidly growing disciplines in the 21st century.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

HFE-800 Human Factors Research Background 6
HFE-810 Human Factors Research Methodologies 6
HFE-820 Human Factors Future Demands 6
HFE-830 Strategies for Human Factors 6
HFE-840 Human Factors Research Proposal 6
HFE-900 Human Factors Doctoral Writing I 6
HFE-910 Human Factors Doctoral Writing II 6
HFE-920 Human Factors Doctoral Writing III 6
HFE-930 Human Factors Doctoral Writing IV 6
HFE-940 Human Factors Defense 6

Industrial Hygiene (PhD)

The Doctor of Philosophy in Industrial Hygiene is designed to provide current professionals in the safety and occupational construction field with an opportunity to conduct extensive and sustained, original research at the highest level. This program offers a path for Industrial Hygiene personnel to explore new ground in the rapidly evolving world of the commercial and governmental safety; industrial construction and hygiene. Graduates will contribute significantly to the Industrial Hygiene field through the creation of new knowledge, ideas and technology.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

HYG-800 Industrial Hygiene Implications (6 credits)
HYG- 810 New Hazards to Industrial Hygiene (6 credits)
HYG-820 Advanced Research Methods for Industrial Hygiene (6 credits)
HYG-830 Comprehensive Strategies for Industrial Hygiene (6 credits)
HYG- 840 Industrial Hygiene Research Proposal (6 credits)
HYG-900 Industrial Hygiene Doctoral Writing I (6 Credits)
HYG-910 Industrial Hygiene Doctoral Writing II (6 Credits)
HYG-920 Industrial Hygiene Doctoral Writing III (6 Credits)

HYG-930 Industrial Hygiene Doctoral Writing IV (6 Credits)
HYG-940 Industrial Hygiene Doctoral Defense (6 Credits)

Manufacturing (PhD)

The Doctor of Philosophy in Manufacturing is an interdisciplinary program designed to meet the demands for the highest skilled professionals to become the leaders involved in the advancement of the manufacturing industry. The design of manufacturing for increased revenue, lower costs, time to market, and higher quality is more demanding in today's competitive global market and with the Introduction of mechatronics and robotics engineering.

This program provides students with an opportunity to conduct extensive and sustained original research at the highest level. Graduates will contribute significantly to the manufacturing field through the creation of new knowledge and ideas as the sector expands and uses technology to evolve.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

MAF-800 Manufacturing Research Background 6
MAF-810 Manufacturing Research Methodologies 6
MAF-820 Manufacturing Future Demands 6
MAF-830 Strategies for Manufacturing 6
MAF-840 Manufacturing Research Proposal 6
MAF-900 Manufacturing Doctoral Writing I 6
MAF-910 Manufacturing Doctoral Writing II 6
MAF-920 Manufacturing Doctoral Writing III 6
MAF-930 Manufacturing Doctoral Writing IV 6
MAF-940 Manufacturing Doctoral Defense 6

All required courses are offered exclusively online in a 16-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Military Leadership (PhD)

The PhD in Military leadership is designed for those serving in either senior Officer or Enlisted positions that want to take their leadership skills to a higher level for serving and protecting the Nation. It is also suitable for those associated with the operations of military personnel, defense contractors or DoD agencies. In a world where the advancement of technology is increasing at a faster pace, this degree is research based and will support your development of critical thinking, leading edge theory and applications in this special role. This degree prepares you for effective leadership in the arena of defense; to lead, to direct and to manage personnel, technology, and resources on a global platform.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

MIL 800 - Military Leadership Research Background 6
MIL 810 - Military Leadership Research Methodologies 6
MIL 820 – Military Leadership Future Demands 6
MIL 830 - Military Leadership 6
MIL 840 - Military Leadership Research Proposal 6
MIL 900 - Military Leadership Doctoral Writing I 6
MIL 910 – Military Leadership Doctoral Writing II 6
MIL 920 - Military Leadership Doctoral Writing III 6
MIL 930 – Military Leadership Doctoral Writing IV 6
MIL 940 – Military Leadership Doctoral Defense 6

Occupational Health and Safety (PhD)

The Doctor of Philosophy in Occupational Health and Safety is designed to meet the needs of the highest skilled professionals to become the leaders who support, advance, and expand the occupational health and safety field. This program provides a path for occupational health and safety professionals to explore new ground in the evolving field at the local, national, and global levels. Graduates will contribute to the occupational health and safety field through the creation of new ideas in response to the impact of increasing technology. Students who complete the program can expect to fill executive and senior-level positions in commercial companies as well as local, state, and federal government.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

SAF-800 Occupational Health and Safety Implications 6
SAF-810 New Hazards to Occupational Health and Safety 6
SAF-820 Advanced Research Methods for Occupational Health and Safety 6
SAF-830 Comprehensive Strategies for Occupational Health and Safety 6
SAF-840 Occupational Health and Safety Proposal 6
SAF-900 Occupational Health and Safety Doctoral Writing I 6
SAF-910 Occupational Health and Safety Doctoral Writing II 6
SAF-920 Occupational Health and Safety Doctoral Writing III 6
SAF-930 Occupational Health and Safety Doctoral Writing IV 6
SAF-940 Occupational Health and Safety Doctoral Defense 6

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Product Management (PhD)

The Doctor of Philosophy in Product Management is designed to meet the demands of the highest skilled professionals to become the leaders who advance, expand, and support product management on both a large and small scale. This program enables current professionals in the field to elevate their skills to the highest level and explore new ground, as the product management industry faces revolutionary changes in competitive local, national, and global markets. Graduates will be prepared for executive and senior-level management positions in commercial, military, civil, and high-technology companies, where they will serve as subject matter experts.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

PRM-800 Product Management Research Background Implications 6
PRM-810 Product Management Research Methodologies 6
PRM-820 Product Management Future Demands 6
PRM-830 Strategies for Product Management 6
PRM-840 Product Management Research Proposal 6
PRM-900 Product Management Doctoral Writing I 6
PRM-910 Product Management Doctoral Writing II 6
PRM-920 Product Management Doctoral Writing III 6
PRM-930 Product Management Doctoral Writing IV 6
PRM-940 Product Management Doctoral Defense 6

All required courses are offered exclusively online in a 16-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Quantum Computing (PhD)

Doctor of Philosophy in Quantum Computing is designed to provide students with the opportunity to conduct extensive and sustained original research. Quantum Computing harnesses and exploits the laws of quantum mechanics to process information. Using the phenomena of superposition and entanglement, a quantum computer can process a vast number of calculations simultaneously. Difficult task that there was once thought impossible for classical computers can be achieved quickly and efficiently using quantum computing. Graduates will contribute significantly to the Quantum Computing discipline through the creation of new knowledge and ideas. The PhD in Quantum Computing program is designed as a research doctorate where students quickly become able to engage in scholarly research and publishing.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

CSQ-800 Quantum Computing Research Background 6
CSQ-810 Quantum Computing Research Methodologies 6
CSQ-820 Quantum Computing Future Demands 6
CSQ-830 Quantum Computing 6
CSQ-840 Quantum Computing Research Proposal 6
CSQ-900 Quantum Computing Doctoral Writing I 6
CSQ 910 Quantum Computing Doctoral Writing II 6
CSQ 920 Quantum Computing Doctoral Writing III 6
CSQ 930 Quantum Computing Doctoral Writing IV 6
CSQ 940 Quantum Computing Doctoral Defense 6

Real Estate Management (PhD)

The Doctor of Philosophy in Real Estate Management degree is a unique program designed to meet the long-standing needs of today's Real Estate Management in an ever changing world of commercial, private and of course the concept of smart cities. The PhD in Real Estate Management program provides students with the opportunity to conduct extensive and sustained, original research at the highest level in the field of Real Estate Management. The PhD in Real Estate Management is designed to meet the demands of the next generation of new buildings and mod needs of existing ones. The Ph.D. in Real Estate Management is for current leaders in the field who desire to elevate their skills to the highest level and to contribute to the body of knowledge in Real Estate Management.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits
REM-800 Ph.D. in Real Estate Management Research Background 6
REM-810 Real Estate Management Research Methodologies 6
REM-820 Real Estate Management Future Demands 6
REM-830 Strategies for Real Estate Management 6
REM-840 Real Estate Management Research Proposal 6
REM-900 Real Estate Management Doctoral Writing I 6
REM-910 Real Estate Management Doctoral Writing II 6
REM-920 Real Estate Management Doctoral Writing III 6
REM-930 Real Estate Management Doctoral Writing IV 6
REM-940 Real Estate Management Doctoral Defense 6

Space Cybersecurity (PhD)

The Doctor of Philosophy in Space Cybersecurity degree is a unique program designed to meet the long-standing needs of today's United States Space Cybersecurity in an ever-changing world of conflict. Capitol Technology University is uniquely place academically to offer this degree with its geographical location, location on Institutes and Agencies that are dedicated to supporting and protecting this industry. The PhD in Space Cybersecurity program provides students with the opportunity to conduct extensive and sustained, original research at the highest level in the field of Space Cybersecurity. The PhD in Space Cybersecurity is designed to meet the demands of the military to become leaders who will be involved in the advancement, expansion and support of the Space Cybersecurity environment on an international and domestic setting. The PhD in Space Cybersecurity is for current leaders in the field who desire to elevate their skills to the highest level and to contribute to the body of knowledge in Space Cybersecurity.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits
SCS-800 Space Cybersecurity Research Background 6
SCS-810 Space Cybersecurity Research Methodologies 6
SCS-820 Space Cybersecurity Future Demands 6
SCS-830 Space Cybersecurity 6
SCS-840 Space Cybersecurity Research Proposal 6
SCS-900 Space Cybersecurity Doctoral Writing I 6
SCS-910 Space Cybersecurity Doctoral Writing II 6
SCS-920 Space Cybersecurity Doctoral Writing III 6
SCS-930 Space Cybersecurity Doctoral Writing IV 6
SCS-940 Space Cybersecurity Doctoral Defense 6

Technology (PhD)

The Doctor of Philosophy in Technology is designed for working professionals who conduct research in their career fields. The program is tailored to enable students to select a focused research topic applicable to their industry. Coursework covers writing, citation, and research ethics in technology, and students have the option to either undertake a thesis or publication route for the completion of degree requirements.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

TEC-800 Writing the Doctoral Proposal I 6
TEC-810 Writing the Doctoral Proposal II 6
TEC-820 Writing the Doctoral Proposal III 6
TEC-830 Writing the Doctoral Proposal IV 6
TEC-840 Doctoral Proposal Oral Defense 6
TEC-900 Doctoral Research Preparation I 6
TEC-910 Doctoral Research Preparation II 6
TEC-920 Doctoral Research Preparation III 6
TEC-930 Doctoral Research Preparation IV 6
TEC-950 Doctoral Presentation and Oral Defense 6

All required courses are offered exclusively online in a 16-week asynchronous format.

For descriptions of required courses, see listing beginning on page 152.

Technology Combination Program (MS/PhD)

The Master of Science/Doctor of Philosophy Technology Combination Program is an extension of the Doctor of Philosophy in Technology. Students who do not have the required graduate level knowledge complete a sequence of master's courses that lead directly into the PhD in Technology program. The Doctor of Philosophy in Technology is designed for working professionals who conduct research in their career fields. The program is tailored to enable students to select a focused research topic applicable to their industry. Coursework covers writing, citation, and research ethics in technology, and students have the option to either undertake a thesis or publication route for the completion of degree requirements.

Course Sequence of Study
Doctor of Philosophy in Technology with 90 Credits
Master of Science in Research Methods 30 Credits
Course Credits

TEC-700 Project I: Fundamentals of Graduate Research and Design 6
TEC-710 Project II: Ethics and Philosophy of Research and Data Collection 6
TEC-720 Project III: Qualitative and Quantitative Research Design 6
TEC-730 Project IV: Applied Statistics, Analytics, Decision Analysis, and Visualization 6
TEC-740 Project V: Capstone Project 6

Master of Science in Research Methods 60 Credits
Course Credits
TEC-800 Writing the Doctoral Proposal I 6
TEC-810 Writing the Doctoral Proposal II 6
TEC-820 Writing the Doctoral Proposal III 6
TEC-830 Writing the Doctoral Proposal IV 6
TEC-840 Doctoral Proposal Oral Defense 6
TEC-900 Doctoral Research Preparation I 6
TEC-910 Doctoral Research Preparation II 6
TEC-920 Doctoral Research Preparation III 6
TEC-930 Doctoral Research Preparation IV 6
TEC-950 Doctoral Presentation and Oral Defense 6

All required courses are offered exclusively online in a 16-week asynchronous format.
For descriptions of required courses, see listing beginning on page 152.

Unmanned Systems Applications (PhD)

Unmanned Systems is a fast-growing sector of the aviation industry. Students have the option to undertake either a thesis or publication route for the completion of degree requirements. The program is tailored to enable students to select a focused research topic applicable to their industry. Topics covered include autonomous technologies, machine learning, engineering, and cybersecurity.

Course Sequence of Study
Doctor of Philosophy 60 Credits
Course Credits

TEC-800 Writing the Doctoral Proposal I 6
TEC-810 Writing the Doctoral Proposal II 6
TEC-820 Writing the Doctoral Proposal III 6
TEC-830 Writing the Doctoral Proposal IV 6
TEC-840 Doctoral Proposal Oral Defense 6
TEC-900 Doctoral Research Preparation I 6
TEC-910 Doctoral Research Preparation II 6
TEC-920 Doctoral Research Preparation III 6
TEC-930 Doctoral Research Preparation IV 6
TEC-950 Doctoral Presentation and Oral Defense 6

All required courses are offered exclusively online. For descriptions of required courses, see listing beginning on page 152.

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. Master's courses are available during each term with two intake dates per semester. 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 an accredited institution or an international equivalent, 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 the 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 applications are complete.

Program-Specific Prerequisites

Generally, to apply to a graduate degree program, you should have completed a bachelor's degree or be completing a bachelor's degree prior to enrollment and should have a 3.0 cumulative grade point average or higher. Some Master of Science programs have additional technical competency requirements.

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

- A Bachelor of Science degree in Computer Science or related area is recommended, but not required.
- Students who do not have a BS in Computer Science or related area must have the following programming knowledge: Proficiency in computer topics, including programming (one or more of Python, Java or C++ recommended), object oriented programming (classes, objects, inheritance and polymorphism), data structures (queues, stacks, lists, linked lists and trees).

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.

Engineering Technology

- Bachelor of Science in Engineering Technology or Engineering is preferred
- Mathematics: Calculus, Linear Algebra, and Ordinary Differential Equations preferred.

Aviation (MS)

The Master of Science in Aviation is designed to meet the growing needs of today's business and government environments where aviation is now a major business consideration. Students learn how to integrate business and decision-making skills in the technologically complex aviation and business environment. The program builds a foundation that encompasses technology, management, marketing, accounting, finance, information technology, and human resource management. The program will prepare students for advanced management and leadership positions in the aviation industry and related businesses.

Course Requirements

Master of Science 36 Credits

Course Credits

Core Courses 36 Credits
AVT-616 Aviation Financial and Contract Management 3
AVT-625 Organizational Behavior in the Aviation Environment 3
AVT-627 Impact of Emerging Technology on Aviation 3
AVT-631 Aviation Personnel Management 3
AVT-635 Technology-Enabled Aviation Operations 3
AVT-646 Aviation Project Management 3
AVT-650 Strategic Aviation Management 3
AVT-671 Airport Management 3
AVT-674 Airline Management 3
AVT-686 Aviation Cybersecurity Management 3
AVT-700 Aviation Research Project I 3
AVT-701 Aviation Research Project II 3

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Aviation Cybersecurity (MS)

The Master of Science in Aviation Cybersecurity is designed to meet the growing needs of today's business and government environments. The program provides aviation and security professionals with an in-depth study of technological developments, applications, and considerations in the aviation industry as they relate to real-life industry challenges. The National Security Agency and Department of Homeland Security have designated Capitol Technology University a National Center of Academic Excellence in Cybersecurity. The program is mapped to all current federal domains at the most advanced level specified in the standards, and also covers the 8 domains of the CISSP (Certified Information Systems Security Professional), considered the gold-standard of industry certification. The required core courses build a foundation that encompasses technology, management, marketing, accounting, finance, information technology, and human resource management.

Course Requirements
Master of Science 33-36 Credits
Course Credits

Aviation 12 Credits
AVT-627 Impact of Emerging Technology on Aviation 3
AVT-635 Technology-Enabled Aviation Operations 3
AVT-686 Aviation Cybersecurity Management 3
AVT-703 Aviation Cybersecurity Research Project 3

Cybersecurity 21 Credits
IAE-500 Introduction to Information Assurance* 3
IAE-675 Computer Forensics and Incident Handling 3
IAE-677 Malicious Software 3
IAE-679 Vulnerability Mitigation 3
IAE-680 Perimeter Protection 3
IAE-682 Internal Protection 3
IAE-685 Principles of Cybersecurity 3

Computer Science 3 Credits
CS-620 Operating System Principles for Information Assurance** 3

*IAE-500 can be waived with appropriate documentation.
**Course substitution can be granted for CS-620 for students who demonstrate knowledge of UNIX and C programming.

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Aviation Maintenance (M.Res.)

The Master of Research (M.Res.) in Aviation Maintenance degree is a unique program designed to meet the long-standing needs of disseminating research skills to those working with and dealing with the aviation related to all aspects of maintenance. The proposed M.Res. in Aviation Maintenance is for current professionals in the field of Aviation and those with associate knowledge that is needed to be incorporated into research. The University is in a unique position to give those students an avenue to pursue a deep proficiency in this area using an interdisciplinary methodology, cutting-edge courses, and dynamic faculty. Graduates will contribute significantly to the Aviation Maintenance field through the creation of new knowledge and ideas. The M.Res. in Aviation Maintenance program is designed as a degree by research where students will quickly become able to engage in leadership, research, and publishing. It is aimed at those that may want to explore research studies before starting a Doctorate by research. Likewise, those that work in research and want a master's qualification but in a subject specific to their work. Aviation is becoming more technical and managing this requires higher skills in a larger percentage of the workforce. The university has a significant experience in aviation and aerospace subjects. Four faculty are Fellows of the Royal Aeronautical society and many faculty/adjuncts are members.

Course Requirements
Master of Business Administration 30 Credits
Course Credits

AMM-700 Fundamentals of Graduate Research & Design* 6
AMM-710 Ethics & Philosophy of Research & Data 6
AMM-715 Aviation Maintenance Research Proposal 6
AMM-725 Aviation Maintenance Research & Data Collection 6
AMM-735 Aviation Maintenance Thesis and Defense 6

*AMM-700 must be taken as the only class in the first semester. NO more than one classes allowed in following semesters.

Business Administration (MBA)

The Master of Business Administration is designed to support professionals 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 leadership skills, enhancing understanding of new technologies, expanding ability to use technology to solve business problems, and understanding the process of innovation. Specialization options include Aviation, Aviation Cybersecurity, Construction Safety, Critical Infrastructure, Cybersecurity, Data Analytics, Engineering Technology, Federal Acquisitions and DoD Contracting, and Unmanned and Autonomous Systems.

Course Requirements
Master of Business Administration 36-39 Credits
Course Credits

Core Requirements 27-30 Credits
MBA-600 Fundamentals of Professional Management* 3
MBA-615 Financial Management 3
MBA-616 Financial and Contract Management 3
MBA-625 Organizational Behavior in Technical Environment 3
MBA-630 Marketing Process and Strategy 3
MBA-631 Technical Personnel Management 3
MBA-635 Technology-Enabled Operations 3

Graduate Studies
MBA-640 Managerial Economics 3
MBA-646 Federal Contract Project Management 3
MBA-650 Strategic Management 3

Electives*9 Credits
MBA Electives (3)
****MBA may be any 3 graduate level courses from the Capitol inventory. Or students can focus in a specialization area from the following list.***

Aviation
AVT-627 Impact of Emerging Technology on Aviation 3
AVT-635 Technology-Enabled Aviation Operations 3
AVT-650 Strategic Aviation Management 3

Aviation Cybersecurity
AVT-627 Impact of Emerging Technology on Aviation 3
IAE-685 Principles of Cybersecurity 3
AVT-686 Aviation Cybersecurity Management 3

Construction Safety
SAF-600 Construction Safety Math and Metrics 3
SAF-610 Advanced Industrial Hygiene 3
SAF-620 Advanced Hazardous Materials 3

Critical Infrastructure
CRI-501 Critical Infrastructure Introduction 3
CRI-510 Critical Infrastructure I: Performance and Risk Analysis of Infrastructure 3
CRI-520 Critical Infrastructure II: Security Management of Critical Infrastructure 3

Cybersecurity
IAE-685 Principles of Cybersecurity 3
IAE-640 Access and Identity Management 3
IAE-673 Secure Information Transfer and Storage 3

Data Analytics
MBA-510 Analytics and Decision Analysis 3
MBA-515 Applied Statistics and Visualization for Analytics 3
MBA-520 Big Data Warehousing and Analytic Systems 3

Engineering Technology
EE-600 Mathematical Analysis 3
EE-710 Designing for Reliability and Manufacturability 3
EE-720 Designing for Testability 3

Graduate Studies
Federal Acquisitions & Contracting
MBA-701 Federal Acquisitions & Contracting 3
MBA-702 Mergers and Acquisitions 3

MBA-703 Software Acquisitions 3
Unmanned and Autonomous Systems
UAS-501 Unmanned Vehicle Theory and Practice 3
UAS-650 UAS Laws, Regulations and Policy 3
UAS-670 UAS Management for Managers 3

MBA-600 is waived for students who have completed an undergraduate degree in business within the past five years.

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Computer Science (MS)

The Master of Science in Computer Science is structured to focus on new technologies, graphics aimed at virtual realities, and the Internet. The program provides students with the advanced knowledge and skills necessary to design and use computer-based systems, with an emphasis on emerging technologies, including embedded languages, wireless technologies, miniaturization (PDAs), and data security. Students study computer language design, intelligent systems design, and multi-threaded and distributed programming and may specialize in an area of their choice, including information architecture, network security or advanced computer science. All students complete a capstone in which they identify a research topic and develop a major project-based research paper.

Course Requirements
Master of Science 30 Credits
Course Credits

Core Courses 15 Credits (Complete 5 of the following 7 courses)
CS-502 Predictive Analytics 3
CS-507 Database Systems Implementation 3
CS-510 Algorithms 3
CS-604 Accelerated and Parallel Computing 3
CS-605 Intelligent Automation 3
CS-701 Artificial Intelligence 3
CS-714 Computer Science Seminar 3

Electives-5 courses (drawn from the following lists)
Artificial Intelligence
CS-511 Statistical Methods in Data Science 3
CS-610 Machine Learning and Neural Networks 3
CS-710 Big Data 3
CS-711 Computer Vision and Deep Learning 3
CS-716 Advanced Artificial Intelligence 3

Software Engineering
CS-505 Introduction to Software Design with UML 3
CS-506 Requirements/Resource Analysis 3
CS-512 Computer Language Design 3
CS-551 Software Testing 3
CS-552 Agile Methods 3
CS-705 Multithreaded and Distributed Programming 3

Other technical or other non-technical elective 3

All required courses are offered exclusively online. For descriptions of required courses, see listing beginning on page 152.

Construction Cybersecurity (MS)

The MS in Construction Cybersecurity degree program is designed to meet the growing needs of today's business and government where construction cybersecurity is now a major consideration. This degree provides advanced graduate-level management education where the latest construction cybersecurity concepts are reviewed and analyzed with a laser focus. Throughout the program, the latest technological developments, applications, and considerations in the construction industry are explored and applied to real-life industry challenges. Students will learn optimum methods and techniques in construction cybersecurity and how to define related resources and associated risks at an executive level in order to maintain profitability, manage work effectivity and efficiently, and ensure customer satisfaction.

Course Requirements
Master of Science 30-36 Credits
Course Credits

Construction Required 12 Credits
CRI-501 Critical Infrastructure Introduction 3
CM-600 Cybersecurity Impacts on Construction Industry 3
CM-602 Construction Industry Software 3
CM-700 Construction Cybersecurity Research Project I 3

Cybersecurity Required 21 Credits
IAE-500 Introduction to Information Assurance* 3
IAE-630 SCADA Networks and ICS Security 3
IAE-675 Computer Forensics and Incident Handling 3
IAE-677 Malicious Software 3
IAE-679 Vulnerability Mitigation 3
IAE-682 Internal Protection 3
IAE-685 Principles of Cybersecurity 3

Computer Science 3 Credits
CS-620 Operating System Principles for Information Assurance** 3

****Students who can demonstrate knowledge of information assurance topics at an undergraduate level either through undergraduate transcripts, certifications, or work experience may have IAE500 waived with appropriate documentation which is evaluated at the time of admission.***

*****Students who can demonstrate knowledge of the UNIX operating system and C programming language may request that an appropriate elective be used to substitute for CS-620 by contacting the department chair. Students are encouraged to substitute IAE-621 or 673 if this course is waived or not taken.***

Construction Safety (MS)

The Master of Science in Construction Safety prepares students to understand the requirements of what it takes for wide range of safety careers in construction-related fields. Students will acquire a strong foundation in construction, safety, risk management, and management skills.

Course Requirements
Master of Science 36 Credits
Course Credits

SAF-600 Construction Safety Math and Metrics 3
SAF-610 Advanced Industrial Hygiene 3
SAF-620 Advanced Hazardous Materials 3
SAF-630 Advanced Environmental Management 3
SAF-640 Construction Ergonomics 3
SAF-650 Specific Construction Hazards 3
SAF-660 Construction Safety Program Development 3
SAF-670 Advanced Safety Management Systems 3
SAF-680 Construction Risk Management Methods 3
SAF-700 Safety in Facilities and Capital Construction 3
SAF-710 Training Performance and Evaluation 3
SAF-720 Construction Safety Leadership 3

Counterterrorism (MS)

The Master of Science (M.S.) in Counterterrorism degree is a unique program designed to meet the long-standing needs of today's business and government environments for knowledge, methodologies and analytic tools involved in combatting terrorism. The M.S. in Counterterrorism program will provide students with the opportunity to conduct extensive and sustained, original research, including the application of methodologies and software tools employed at the highest levels in the field of counterterrorism.

The M.S. in Counterterrorism is designed to meet the demands of the highest-skilled professionals to become analysts and leaders who will be involved in the advancement, expansion and support of the counterterrorism environment on a large and small scale.

Course Requirements
Master of Science 30 Credits
Course Credits

Counterterrorism Core 21 Credits
CTR-600 Introduction to Terrorism and Counterterrorism 3
CTR-610 Methods of Terrorists 3
CTR-620 Elements of Counterterrorism 3
CTR-630 Methods of Counterterrorism 3
CTR-640 Tools and Techniques of Counterterrorism 3
CTR-680 Seminar in Terrorism and Counterterrorism 3
CTR-705 Counterterrorism Capstone Project 3

Intelligence and International Security Studies 3 Credits
INT-501 Intelligence, International Security, Counterterrorism, and Homeland Security Integration 3

Critical Infrastructure 3 Credits
CRI-501 Critical Infrastructure Introduction 3

Cybersecurity 3 Credits
IAE-685 Principles of Cyber Security 3

Critical Infrastructure (MS)

The Master of Science in Critical Infrastructure is designed to meet the increasing needs of the manufacturing and production industry. The program seeks to enable graduates to address one of the greatest challenges of the 21st century: create a robust and sustainable infrastructure that enables life as we know it. Students gain an in-depth knowledge of the 16 critical infrastructure sectors and obtain a foundation in policy, risk management, operations, and mission planning.

Course Requirements
Master of Science 30-36 Credits
Course Credits

IAE-500 Introduction to Information Assurance 3
CS-620 Operating System Principles for Information Assurance* 3
CRI-501Critical Infrastructure Introduction 3
IAE-630 SCADA Networks and ICS Security 3
IAE-685 Principles of Cybersecurity 3
CRI-510 Critical Infrastructure I: Performance and Risk Analysis of Infrastructure Systems 3

Graduate Studies

CRI-520 Critical Infrastructure II: Security Management of Critical Infrastructure 3
IAE-675 Computer Forensics and Incident Handling 3
IAE-677 Malicious Software 3
IAE-679 Vulnerability Mitigation 3
IAE-682 Internal Protection** 3
CRI-710 Critical Infrastructure Capstone 3

Students who can demonstrate knowledge of the UNIX operating system and C programming language may request that an appropriate elective be used to substitute for CS-620 by contacting the department chair.

***** It is recommended that students complete IAE-685 before taking this course, but this is not a requirement. Students who can either demonstrate knowledge of information assurance topics at an undergraduate level through undergraduate transcripts, certifications, or work experience may have IAE-500 waived with appropriate documentation, which is evaluated at the time of admission.***

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Graduate Studies

Cyber Analytics (MS)

The Master of Science in Cyber Analytics is designed to meet the needs of government, industry and non-profits to evaluate the statistical data generated by their computing infrastructure to determine the state of the organization's security posture on an ongoing basis. These statistics are often referred to generically as Big Data, but the reality is this information must be combined with relevant facts specific to the entity such as competitors, market position and socio-political factors to determine the threat landscape. This program combines a strong foundation in cybersecurity with hands-on project-based coursework providing analytic experience that can be applied to a wide range of growing concerns.

Course Requirements
Master of Science 36-39 Credits
Course Credits

Cybersecurity 24-27 Credits
IAE-500 Introduction to Information Assurance* 3
CS-620 Operating Systems Principles for Information Assurance** 3
IAE-685 Principles of Cybersecurity*** 3
IAE-640 Access and Identity Management 3
IAE-673 Secure Information Transfer and Storage 3
IAE-679 Vulnerability Mitigation 3
IAE-690 Healthcare Info System Security 3
IAE-692 Mobile Medical Device/Application Security 3
IAE-705 Master's Capstone**** 3

Cyber Analytics 12 Credits
MBA-510 Analytics and Decision Analysis 3
MBA-515 Applied Statistics and Visualization for Analytics 3
MBA-520 Big Data Warehousing and Analytic Systems 3
MBA-540 Web Analytics 3

IAE-500 can be waived with appropriate documentation.
*****Course substitution can be granted for CS-620 for students who demonstrate knowledge of UNIX and C programming.***
******IAE-685 is a prerequisite to all other IAE courses.***
*******This course is to be the last course taken in the degree completion process.***

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Cyberpsychology (M.Res.)

The Master of Research (M.Res.) in Cyberpsychology degree is a unique program designed to meet the long-standing needs of disseminating research skills to those working with and dealing with the psychology related to all aspects of cybersecurity. The proposed M.Res. in Cyberpsychology degree is for current professionals in the field of cyber and those with associate knowledge that is needed to be incorporated into research. The University is in a unique position to give those students an avenue to pursue a deep proficiency in this area using an interdisciplinary methodology, cutting-edge courses, and dynamic faculty. Graduates will contribute significantly to the Cyber Psychology field through the creation of new knowledge and ideas. The M.Res. in Cyberpsychology program is designed as a degree by research where students will quickly become able to engage in leadership, research, and publishing. It is aimed at those that may want to explore research studies before starting a Doctorate by research. Likewise, those that work in research and want a master's qualification but in a subject specific to their work.

Course Requirements
Master of Research 30 Credits
Course Credits

CYP-700 Fundamentals of Graduate Research & Design 6
CYP-710 Ethics & Philosophy of Research & Data Collection 6
CPY-715 Cyber Psychology Research Proposal 6
CPY-725 Cyber Psychology Research & Data Collection 6
CPY-735 Cyber Psychology Thesis and Defense 6

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Cybersecurity (MS)

The Master of Science in Cybersecurity 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 8 domains of the CISSP (Certified Information Systems Security Professional), considered the gold standard certification.

Course Requirements
Master of Science 36-39 Credits
Course Credits

Core Courses 27-30 Credits
IAE-500 Introduction to Information Assurance* 3
CS-620 Operating Principles for Information Assurance* 3
IAE-671 Legal Aspects of Computer Security and Information Privacy 3
IAE-675 Computer Forensics and Incident Handling 3
IAE-677 Malicious Software 3
IAE-679 Vulnerability Mitigation 3
IAE-680 Perimeter Protection 3
IAE-682 Internal Protection 3
IAE-685 Principles of Cybersecurity 3
IAE-674 Security Risk Management Capstone 3

Electives (Choose 3 courses) 9 Credits
CS-713 Design of Cloud Networks and Services 3
IAE-611 Wireless Security 3
IAE-620 Mobile Device Forensics 3
IAE-621 Applied Wireless Network Security 3
IAE-640 Access and Identity Management 3
IAE-684 Complementary Security (CISSP) 3
IAE-690 Healthcare Info System Security 3
IAE-692 Mobile Medical Device Application Security 3
MBA-510 Analytics and Decisions Analytics
MBA-515 Applied Statistics and Visualization Analysis
MBA-520 Big Data Warehousing and Analytical Systems
MBA-646 Federal Contract Project Management

Graduate Studies

**IAE-500 and CS-620 can be waived with department chair or dean approval. A course substitution is required for CS-620, if waived.*

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Engineering Technology (MS)

The Master of Science in Engineering Technology is structured to educate students to design and develop applications from the inception stage through the manufacturing, testing and delivery of a product. The program provides traditional engineers with the fundamentals of design, modeling, analysis, and construction, as well as government and industry regulations.

Students study mathematical analysis, professional management, and advanced concepts of design for reliability, manufacturability and testability with an emphasis on the practical applications that meet industrial, military and international standards.

Course Requirements
Master of Science 30 Credits
Course Credits

Core Courses 18 Credits
EE-600 Mathematical Analysis 3
MBA-600 Fundamentals of Professional Management 3
MBA-635 Technology-Enabled Operations 3
MBA-627 Impact of Emerging Technology on Management and Public Administration 3
EE-710 Designing for Reliability and Manufacturability 3
EE-720 Designing for Testability 3

Capstone Courses 6 Credits
EE-708 Master's Project Research 3
EE-758 Master's Project 3

Recommended Electives (Choose 2 Courses) 6 Credits
IAE-674 Security Risk Management 3
IAE-671 Legal Aspects of Cybersecurity and Information Privacy 3
MBA-615 Financial Management 3
MBA-616 Financial and Contract Management 3
MBA-625 Organizational Behavior in a Technical Environment 3
MBA-631 Technical Personnel Management 3
MBA-646 Federal Contract Project Management 3
MBA-650 Strategic Management 3

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Product Management (MS)

The Master of Science in Product Management provides students with the opportunity to conduct extensive and sustained original research at an advanced level in the field of Product Management. Product Management has evolved recently to a hybrid of scientific reasoning and research, business management, cutting-edge technology, operational analysis, marketing, supply, logistics, and sustainability. The MS in Product Management is a unique master's degree program designed to meet the demands of the highly skilled professionals who want to become the leaders who will be involved in the advancement, expansion, and support of product management on both a large and small scale.

The MS in Product Management is for current professionals in the field who desire to increase their skills to an advanced level and become leaders in Product Management. The MS in Product Management also provides a path for personnel in the Product Management field to explore new ground as this section of the industry faces revolutionary changes in highly competitive local, national, and global markets.

Course Requirements
Master of Science 30 Credits
Course Credits

Required Courses 27 Credits
PRM-500 Becoming the Successful Product Manager 3
PRM-510 Winning Product Management Strategies, Roadmaps, and Business Cases 3
PRM-520 New Products Process 3
PRM-530 Product Management Tools and Metrics 3
PRM-540 Leveraging Expert Systems, Big Data, and Business Analytics for Product Management 3
PRM-600 Designing and Developing Great Products 3
PRM-610 Managing the Life of a Product 3
PRM-625 Product Management Culture, Organizations, and Teams 3
PRM-635 Technology-Enabled Product Management Operations 3

Capstone Course 3 Credits
PRM-700 Product Management Capstone 3

Sustainability (M.Res.)

The Master of Research (M.Res.) in Sustainability degree is a unique program designed to meet the long-standing needs of disseminating research skills to those working with and dealing with the sustainability and in particular the engineering aspects related to all aspects of design, manufacturing and resources. Students will quickly become able to engage in leadership, research, and publishing. It is aimed at those that may want to explore research studies before starting a Doctorate by research. Likewise, those that work in research and want a master's qualification but in a subject specific to their work.

Sustainability in engineering is becoming more technical and managing this requires higher skills in a larger percentage of the workforce.

Course Requirements
Master of Business Administration 30 Credits
Course Credits

SUS-700 Fundamentals of Graduate Research & Design 6
SUS-710 Ethics & Philosophy of Research & Data Collection 6
SUS-715 Sustainability Research Proposal 6
SUS-725 Sustainability Research & Data Collection 6
SUS-735 Sustainability Thesis and Defense 6

Technical MBA in Business Analytics and Data Science (TMBA)

The Technical Master of Business Administration in Business Analytics and Data Science allows students to integrate business and analytical decision-making skills in a technologically complex business environment. Students learn how the business of for-profit and non-profit organizations meld to function successfully. The Business Analytics and Data Science core courses prepare students to structure, transform, and analyze data to gain insights that will provide opportunities to improve business intelligence and managerial decision making. The required courses build a solid foundation encompassing technology, management, marketing, accounting and finance.

Course Requirements
Master of Business Administration 36-39 Credits
Course Credits

Core Courses 24-27 Credits
MBA-600 Fundamentals of Professional Management* 3
MBA-615 Financial Management 3
MBA-616 Financial and Contract Management 3
MBA-625 Organizational Behavior in Technical Environment 3
MBA-627 Impact of Emerging Technology on Management and Public Administration 3
MBA-631 Technical Personnel Management 3
MBA-635 Technology-Enabled Operations 3
MBA-646 Federal Contract Project Management 3
MBA-650 Strategic Management 3

Business Analytics 12 Credits
MBA-510 Analytics and Decision Analysis 3
MBA-515 Applied Statistics and Visualization for Analytics 3
MBA-520 Big Data Warehousing and Analytic Systems 3
MBA-540 Web Analytics 3

*MBA-600 is required for students without a recent undergraduate business degree (completed within the past 5 years) or relevant professional experience.

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Technical MBA in Cybersecurity (TMBA)

The Technical Master of Business Administration in Cybersecurity provides students with a foundation in technology, management, marketing, and business. Graduates will be able to apply their skills and knowledge of the business world to everyday work situations in the general business environment and cybersecurity. While studying business and cybersecurity at the graduate level, the student will learn how organizations function. Students will develop a clear picture of how business areas meld to create a successful organization. The required courses will build a solid foundation that encompasses technology, management, marketing, accounting, finance, Information Technology and human resource management. The student will learn to analyze patterns, employ technological tools and to drive business decisions in the cybersecurity field.

Course Requirements
Master of Business Administration 36-39 Credits
Course Credits

Core Courses 24-27 Credits
MBA-600 Fundamentals of Professional Management* 3
MBA-615 Financial Management 3
MBA-616 Financial and Contract Management 3
MBA-625 Organizational Behavior in Technical Environment 3
MBA-627 Impact of Emerging Technology on Management and Public Administration 3
MBA-631 Technical Personnel Management 3
MBA-635 Technology-Enabled Operations 3
MBA-646 Federal Contract Project Management 3
MBA-650 Strategic Management 3

Cybersecurity 12 Credits
IAE-685 Principles of Cybersecurity 3
IAE-684 Complementary Security 3
IAE-671 Legal Aspects of Cybersecurity and Information Privacy 3
IAE-674 Security Risk Management 3

*MBA-600 is required for students without a recent undergraduate business degree (completed within the past 5 years) or relevant professional experience.

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

Graduate Studies

Unmanned and Autonomous Systems Policy (MS)

The Master of Science in Unmanned and Autonomous Systems (UAS) Policy provides students with the necessary training needed to become a professional in the field. The degree provides a foundation in flight operations, mission planning, special sensors, weapons, surveillance and data collection. Students will develop policy and risk management plans, as well as gain an understanding of aeronautical engineering, technology, and ground control. Students can also become certified Unmanned Aerial Systems Operator and support governmental and commercial employers. A special optional course will prepare students to pass the Federal Aviation Administration Part 107 test to become a commercial UAV Remote Pilot.

Course Requirements
Core Courses 33 Credits

UAS-501 Introduction to Unmanned and Autonomous Systems 3
UAS-502 Unmanned and Autonomous Vehicle Systems 3
UAS-510 Unmanned Systems Autonomy and Automation 3
UAS-520 Unmanned Systems Sensing, Perception, and Processing 3
UAS-530 User Interface for Design and Evaluation 3
UAS-640 Data Analysis and Visualization 3
UAS-650 Unmanned and Autonomous Systems Laws, Regulations, and Policy 3
UAS-660 Safety Management Systems and Unmanned and Autonomous Systems Cybersecurity 3
UAS-670 Unmanned and Autonomous Management for Managers 3
UAS-710 Unmanned and Autonomous Systems Capstone Project I 3
UAS-720 Unmanned and Autonomous Systems Capstone Project II 3

Optional Course
UAS-500 UAS Operator Certification* 1.5

All required courses are offered exclusively online in an 8-week asynchronous format. For descriptions of required courses, see listing beginning on page 152.

****May be added to the required 33 credits above.***

Post-Baccalaureate Certificates

The post-baccalaureate certificates are designed for systems managers and information assurance professionals seeking to update their skills. Certificate students may only apply one relevant transfer course to certificate requirements. No course substitutions are permitted and students must complete all remaining coursework at Capitol Technology University. 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 exclusively online.

Information Technology (12 credits)

This certificate provides a foundation in information technology, data mining and intelligent systems.

Required Courses

MBA-650 Strategic Management 3
CS-502 Predictive Analytics 3
CS-604 Intelligent Automation 3
SM-569 Decision Support and Expert Systems 3

Healthcare Systems Security (12 credits)

This certificate provides a foundation in comprehensive privacy and security for healthcare organizations. The program is structured to emphasize the intersection between healthcare and cybersecurity.

Required Courses

IAE-674 Security Risk Management 3
IAE-690 Healthcare Information Security 3
IAE-692 Mobile Medical Device/App Security 3
CS-710 Big Data Warehousing and Analytics Systems 3

Security Management (12 credits)

This certificate provides students with an understanding of network systems security, including detection, recovery, damage control, and privacy laws. Students are introduced to critical issues, including user involvement, security training, ethics, trust and informed management. Subject matter includes secure data transfer and storage with a history of cryptography and a study of public- and private-key algorithms. The program also addresses risk management, intellectual property, security policy formulation and enforcement, as well as computer forensics and incident handling.

Required Courses

IAE-640 Access and Identity Management 3
IAE-674 Security Risk Management 3
IAE-684 Complementary Security (CISSP) 3
IAE-685 Principles of Cybersecurity 3

Secure Cloud Computing (12 credits)

Required Courses

IAE-680 Perimeter Protection
CS-620 Operating Principles for Information Assurance
CS-710 Big Data Warehousing and Analytics System
CS-713 Design of Cloud Networks and Services

Secure Mobile Technology (12 credits)

Required Courses
IAE-611 Mobile Computing Security
IAE-620 Mobile Device Forensics
IAE-621 Applied Wireless Network Security
IAE-677 Malicious Software

Professional Development and Workforce Training

Capitol Technology University provides workforce professional education and training for a variety of corporate and government needs. The university specializes in offering practical, cutting edge educational programs in cybersecurity, IT, engineering, data analytics, unmanned systems applications and computer science. Training programs can be tailored to meet students' unique needs. Programs can be on-site, on campus, or online.

Capitol's faculty is comprised of industry leaders from technical areas such as Identity, Credentialing, and Access Management and Amazon Web Services, to managerial areas, including project management and business analytics.

Courses

Course Descriptions

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.

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. (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 missionplanning. ***Prerequisite: AE-150. Offered spring semester only. (3-0-3)***

AE-260 Ground System Testing

In this course students will study software testing techniques that are applicable to any satellite ground system. Topics covered include; what is a ground system and why we test, different types of ground system testing, developing test cases, creating test matrices and reports, writing testing requirements and understanding different requirement level requirements, what defines a good/bad test, and SFOTC automated testing. ***Prerequisite: AE-250 or permission of the instructor/department chair. (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. ***Prerequisites: AE-150, CS-150 and EN-102. Corequisite: AE-311. Offered Fall semester 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. ***Coerequisite: MA-340. Offered during Fall semester only. (3-0-3)***

AE-361 Remote Sensing

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-262 and AE-150 Offered Spring semester only. (3-0-3)***

AE-390 Aviation Meteorology

Prepares students with the knowledge necessary to comprehend the fundamentals of meteorology, analyze weather factors, hazards and in-flight weather conditions and weather conditions as they relate to aircraft and flight performance using aviation meteorology charts and internet weather resources. ***(3-0-3)***

AE-400 Special Topics in AE

Research into astronautical engineering subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and academic dean. 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-340 and AE-351 Offered Spring semester only. (3-0-3)***

AE-402 Special Topics in AE II

Research into astronautical engineering subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and academic dean. This course may be repeated with different projects. (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. (3-0-3)***

AE-451 Propulsion

Introduction to rocket engineering, space missions and thrust requirements, liquid and solid- fueled rockets, nuclear and electric propulsion, propellant thermodynamics. ***Prerequisites: AE-351 (3-0-3)***

AE-454 Spacecraft Attitude 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-309 or EE-45 3 Offered Spring semester 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 semester only. (2-2-3)***

AE-457 Senior Design Project I

Students/teams select a project, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements (constraints) and engineering, software, and/or security specifications, propose solutions and multiple designs, analyze proposed designs, and select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper systems engineering and project management to their work. Additional components may be required in some projects. Students/teams submit a final report at the end of the semester. ***Prerequisite: Senior standing. (3-0-3)***

AE-458 Senior Design Project II

Students/teams build and test their selected designs (completed in 457). Each student team delivers a tested prototype and defends its project in front of a panel of experts. Students/ teams submit a final report that includes description of the design, realization, and test processes as well as test results, discussion, and conclusion. Failure to deliver a completed design and a working prototype that meets engineering, software, and/or security specifications by the end of the semester may result in failing the course. *Note: Course must be completed with a grade of C or higher to meet undergraduate graduation requirements. ***Prerequisite: AE-457 (3-0-3)***

AE-463 Space System Engineering Simulation & Modeling

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. ***Offered Spring semester only. (3)***

AMM-700 Fundamentals of Graduate Research & Design

This course will introduce the fundamentals of graduate research and design. The project will focus on graduate level writing, APA style, and the fundamentals of scientific inquiry. The project will cover the areas of technology research, ethics of research, the stages of the research process, conceptualization and operationalization of research questions, data collection techniques, analytics, an introduction to qualitative and quantitative methods and measurement, a discussion of program evaluation research, and research proposal development. (6)

AMM-710 Ethics & Philosophy of Research & Data Collection

This course will address the ethics of conducting scholarly research. The discussion of research ethics will include, but not be limited to, informed consent, protecting anonymity of participants, and ethical participant protocols. Discussions will address the limits of researchers' obligations, along with providing a detailed look at the process of applying for Institutional Review Board approval. This project will provide students with an overview of the range of data collection methods available to individuals undertaking research and to enable the student to consider the implications, application strengths and weaknesses of the various data collection methods. The module will also provide insight into the ways that such methods may be applied effectively and ethically in research. (6)

AMM-715 Aviation Maintenance Research Proposal

Under a Chair, a student will further research the future demands in the Aviation Maintenance field and how these influence specific research questions. Data collection and applications will be central to evaluating the needs of Aviation Maintenance research in the short, medium and long term. The literature review will be more specific in focus and direction at this stage. The ARB will be completed at this stage. (6)

AMM-725 Aviation Maintenance Research & Data Collection

The student will produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and include a timing plan. The student will then complete the research milestones according to the proposal and research plan. The IRB will need to be completed by this stage. (6)

AMM-735 Aviation Maintenance Thesis and Defense

Upon approval from the University Reviewers and Master of Research Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through viva voce (i.e., oral examination). The student's Chair, Committee and Master of Research Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. (6)

AVT-616 Aviation Financial & Contract Management

The course is an Introduction to financial and contract management for aviation managers. The course will cover topics in financial management accounting, direct and indirect costs, revenues, profits, financial position, financial reports, return on investment, net present value, internal rate of return, and cash and funds flow statements in the aviation industry. The course will cover the principles of contract formation, contract financing, subcontracts, and negotiation techniques. Students will present aviation case studies during the course. (3)

AVT-625 Org Behavior in the Aviation Environment

Technology has created amazing new opportunities for aviation. Although the explosive technology growth has increased productivity and advancement, it has also created changes in worker requirements, employee expectations and workplace changes. This course analyzes organizational behavior in an aviation environment. Cases are analyzed to develop skills in applying theories to common aviation managerial problems in technology driven organizations. (3)

AVT-627 Impact of Emerging Tech on Aviation

The course will focus on emerging technologies that influence aviation leadership and management. Students will learn leading edge skills to understand the technologies and innovations that are increasingly changing the aviation landscape. The course will put students at the forefront of new technology to produce value for their future business, employers, and customers. (3)

AVT-631 Aviation Personnel Management

The course delves into the challenges of personnel management in aviation organizations. Topics include the environmental requirements for effective and innovative efforts, direction and motivation, leadership behavior, recruitment of technical staff, orientation and training programs, personnel placement and reassignment, assignment of work, salary administration, personnel evaluation and counseling, professional growth and promotion, technical obsolescence and retraining, equal opportunity programs, employee grievances, and handling of conflict situations. Students explore typical personnel management situations that arise in an aviation organization. (3)

AVT-635 Technology-Enabled Aviation Operations

The course will prepare the student to contribute effectively in today's technology enabled aviation workplace by understanding how to leverage processes, systems, and data to create business value. The course will examine aviation operations in established companies and start-up firms. Students will explore the perspectives and needs of both established and start-up organizations. (3)

AVT-646 Aviation Project Management

The course provides an overview of the theory and practice of managing an aviation project in an organizational setting. Students will gain 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. Project management is examined in the aviation sector. (3)

AVT-650 Strategic Aviation Management

The course examines the objectives, elements and framework of analysis for strategic aviation management. Case studies and aviation virtual simulations will be used as the primary tool of learning and analysis. Students will focus on executive level collaboration, synthesizing information, sound business judgment, aviation expertise and proper communication. (3)

AVT-671 Airport Management

The course provides an in-depth focus on the management of domestic and international airports. Airports possess unique challenges and operational activities that are governed by national and international law. How all these separate entities interact, co-operate and work efficiently is important to understand, manage and develop. The constraints and external influences are dynamic and changing constantly. The course will focus on these aspects, their importance and difficulties. Additionally, the long-term investments and economics of managing airports will be examined for current aviation facilities and new airports. (3)

AVT-674 Airline Management

Commercial airline management is one of the most unique business sectors in the world. Airlines can be large multi-national corporations financed by a government for national prestige or low-cost carriers that operate to maximize all profits by efficient operations. In this course, the different operational models are covered and reviewed against national and international standards. The related topics of recruiting, maintaining staff certifications, and dynamic operations will be addressed at all levels. (3)

AVT-686 Aviation Cybersecurity Management

Aviation cybersecurity management is becoming one of the most important aspects of aviation. Aircraft systems integrity, airport security, security of the passengers and cargo are a few examples of where the reliance on computer networks is significant and the consequences of a breach are great. Students will cover the needs and developments of cybersecurity techniques to minimize or eliminate threats. The course covers aviation cybersecurity management within the context of rapid technological changes. ***(3)***

AVT-700 Aviation Research Project I

Students will begin a graduate level research project in the field of Aviation. The research and thesis development are supervised by a faculty member. The student will research and write the thesis in this course and prepare to defend the thesis in a viva voce (i.e., oral) examination. This course is the second to last course in the program as the student applies accumulated knowledge of program classes to this effort. (3)

AVT-701 Aviation Research Project II

During this course, students will complete the graduate level research project in the field of Aviation that was approved and developed in AVT-700. The research and thesis development are supervised by a faculty member. The thesis must be defended by the student in a viva voce (i.e., oral) examination during the course. This course is the last course in the program. ***Prerequisite: AVT-700.*** (3)

AVT-703 Aviation Cybersecurity Research Project

Students will conduct a graduate level research project in the field of aviation cybersecurity. The research and thesis development are supervised by a faculty member. The student will research and write the thesis in this course and prepare to defend the thesis in a viva voce (i.e., oral) examination. This course is the last course in the program as the student applies accumulated knowledge of program classes to this effort. ***Prerequisite: Should be taken in last semester.*** (3)

AVT-800 Aviation Research Background

The student will focus on the study of Aviation process and developments over the previous decades and how the influences of war, demand and technology has supported the systems and procedures we currently use. In particular, how the current operations and global dictates have resulted in where the industry operates and where there are areas of improvements or failings. The focus will be to start identifying areas for research at a later stage and explore the background. (6)

AVT-810 Aviation Research Methodologies

The student will evaluate and develop research methodologies and strategies suitable for aviation and address the data sources and information to test a hypothesis or research question. It is expected the student will be building upon AVT 800 in refining and developing their research task and plan. ***Prerequisite: AVT-800. (6)***

AVT-820 Aviation Future Demands

The student will research the future demands on a regional, national and global level and how these influence the specific research questions and demands. Data collection and applications will be core to evaluating the needs of aviation on the short, medium and long term. ***Prerequisite: AVT-810 (6)***

AVT-830 Strategies for Aviation

The student will undertake a robust and comprehensive analysis of the strategies for preparation, protection, and resilience of Aviation. Students will be introduced to the influences of economic and politics that dictate aviation planning based upon non-technical aspects to requirements. For example, how noise pollution dictates design and efficiency and even operational usage. ***Prerequisite: AVT-810. (6)***

AVT-840 Aviation Research Proposal

The student will produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and a timing plan. The doctoral student will then complete the research milestones according to the proposal and research plan. ***Prerequisite: AVT-830. (6)***

AVT-900 Aviation Doctoral Writing I

The student will compose and complete Chapters 1 and 2 within the boundaries of the proposal and research plan. Chapters 1-2 will be reviewed by the student's Chair and Committee and must be approved for the student to advance. ***Prerequisite: AVT-840. (6)***

AVT-910 Aviation Doctoral Writing II

The student will compose and complete Chapter 3 within the according to the approved proposal. The student will also submit Chapters 1-3 to the Institutional Review Board (IRB) and Academic Review Board (ARB). After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. ***Prerequisite: AVT-900. (6)***

AVT-920 Aviation Doctoral Writing III

The student will compose and complete Chapter 4. The student will provide a complete and substantive presentation of the research results in Chapter 4. The student's Chair and Committee must review and approve Chapter 4 for the student to advance. ***Prerequisite: AVT- 910. (6)***

AVT-930 Aviation Doctoral Writing IV

The student will compose and complete Chapter 5 and submit the work to the student's Chair and Committee. The student will also finalize all required elements of their research. The student's Chair and Committee must review and approve the complete document. The student's Chair and Committee will then submit the complete document to the University Reviewers and Ph.D. Review Board for approval. The student must receive approval from the University Reviewers and Ph.D. Review Board to advance forward. ***Prerequisite: AVT-920. (6)***

AVT-940 Aviation Doctoral Defense

Upon approval from the University Reviewers and Ph.D. Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through viva voce (i.e., oral examination). The student's Chair, Committee and Ph.D. Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. ***Prerequisite: AVT-930. (6)***

BUS-101 Introduction to Data Science

Fundamental coursework on the standards and practices for collecting, organizing, managing, exploring, and using data. Topics include preparation, analysis, and visualization of data and creating analysis tools for larger data sets. ***Co-requisite: MA-112. (3-0-3)***

BUS-114 Advanced Excel

This course stresses the ten core areas of advanced Excel usage: advanced formula; tables and formatting; conditional formatting; advanced charting; pivot tables and pivot reporting; VBA and macros; using Excel productively; data tables, simulations and solver; Excel integration with other tools; and optimizing Excel. Practice with data sets will allow students to use Excel in realistic simulations. (3-0-3)

BUS-174 Introduction to Business & 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. (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-202- Introduction to Sports Management

This Introduction to the professional area of sport management discusses basic philosophy and principles of sport management at all levels. Management encompasses the activities associated with administration, supervision, and leadership. This course satisfies a general or social science elective. (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-240 Statistical Methods in Data Science

Statistical concepts and applications related to data science including advanced exploratory data analysis, nonparametric inference and simulation for larger datasets, logistic regression modeling, statistical programming, and basics of machine learning. ***Prerequisite: MA-114.*** (3-0- 3)

BUS-245 Writing & Communication in Data Science

This course emphasizes communication skills for professional situations, including effective quantitative summary and public speaking. The courses includes preparing and producing technical documents for specific audiences as well as analyses for general audiences. ***Prerequisite: EN-102.*** (3-0-3)

BUS-246 Business Research Methods

Students will learn the elements of the research process. The course encourages students to step outside the classroom and engage in research projects based on real life case studies. Non-Business Analytics Business majors must take this course. ***Prerequisites: MA 128.*** (3-0-3)

BUS-247 Quant Methods for Bus Analytics

A project-based course where students pursue an approved data-science based research project. The course builds upon the skills acquired in BUS-101 and BUS-240. The course includes topics in advanced data mining, data ethics, and reproducible research. Business Analytics majors must take this course. ***Prerequisite: BUS-240.*** (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-onwork 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. (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

This course examines the role of the human resource professional as a strategic partner in managing today's organizations. Key functions such as recruitment, selection, development, appraisal, retention, compensation, and labor relations are examined in the context of government, private, and public sectors. (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.*** (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-282 Foundations of Economics

This course is an Introduction to economic 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-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-271.*** (3-0-3)

BUS-284 Data ID & Collection Strategies

This course introduces students to the location, collection, classification of data for business purposes. Sources, tools, processing, systems and legal parameters are examined. ***Prerequisite: BUS-240.*** (3-0-3)

BUS-289 Entrepreneurship & Small Bus 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 an 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.*** (3-0-3)

BUS-302 Methods of IT Project Management

This course 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: BUS-301 or equivalent.*** (3-0-3)

BUS-303 Project Management Competitive Advantage

This course 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-310 Data Mining for Effective Decision Making

This course applies analytics to create useful information that provides insights, fosters inquiry, and supports effective decision-making and problem solving. The Students learn and practice utilizing analytics as a tool for achieving a desired outcome. This course provides a review of analytical methodologies and examines the importance of understanding problems, setting objectives, critical thinking and interpreting results. Problems will be addressed in a variety of disciplines. ***Prerequisite: BUS-284 and CS-220.*** (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. ***Prerequisites: MA-128, BUS-301 and BUS- 384.*** (3-0-3)

BUS-358 Internship

This course provides students with 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 and faculty member. ***Prerequisites: junior or senior status. Cumulative GPA 2.8+ and 3.0+ in major required.*** (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-367 Data-Driven Digital Marketing

This course exposes students to core marketing techniques and their application in digital marketing. Students will learn how to design, run, evaluate and improve digital marketing campaigns to meet specific business objectives like customer acquisition and increased brand awareness. This course will cover basic marketing and statistical concepts and introduce different online marketing tools like email marketing, SEO/SEM and social media analytics. ***Prerequisite: BUS-284, BUS-310, BUS-376 and CS-220.*** (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 and MA-111***. (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: BUS-174.*** (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 and BUS-174.*** (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. ***Prerequisite: BUS-376***. (3-0-3)

BUS-384 Productions & 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 & 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 customer's 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 & Behavior

This course integrates the study of management principles and practices with the study of human behavior within organizations. The focus will be upon translation of management and organizational behavior theory to practices that result in organizational effectiveness, efficiency, and human resource development. To understand management and organizational behavior, concepts associated with continuous improvement in individual and group processes will be discussed. Specific attention will be given to Organizational Behaviors, Diversity in Organization, Attitudes and Job Satisfaction, Personality and Values, Perceptions and Individual Decision Making, Motivation Concepts, Foundations of Group Behavior, Communication, Leadership, Power and Politics, and Conflict. ***Prerequisites: BUS-275.*** (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- uilt 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 and 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 and 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 and CS-220.*** (3-0-3)

BUS-396 Data Governance and Stewardship

This course provides an overview of the disciplines of governing data by examining the basic concepts, principles and practices of a data governance program and techniques used to measure success. The essential components of an enterprise-wide program are covered and a road map to execute a successful data governance program is outlined. The course makes data governance real by illustrating the concepts, principles, and practices using case studies. ***Prerequisite: BUS-284.*** (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-279, BUS-301, and BUS-386.*** (3-0-3)

BUS-443 Marketing Analytics: Decision Making in Info Age

This course demonstrates the benefits of using a systematic and analytical approach to marketing decision-making, and helps students develop their skills and confidence in doing such analyses. Analytical approaches covered enable (a) the identification of alternative marketing options and actions, (b) the calibration of opportunity costs associated with each option, and (c) the choice of one or more options with the greatest likelihood of achieving the business goals. With the knowledge gained here, students are better able to make the case for marketing expenditures (based on ROI) that companies are increasingly asking of their executives. ***Prerequisites: BUS 310.*** (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: EN-102, BUS-174, and BUS-372.*** (3-0-3)

BUS-457 Senior Design Project I

Students/teams select a project area, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements, propose solutions and multiple designs, analyze proposed designs, and select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper business and/or systems concepts and project management to their work. Additional components may be required in some projects. Students/ teams submit a final report at the end of the semester. ***Prerequisite: Senior standing.*** (3-0-3)

BUS-458 Senior Design Project II

This is the TBM/MCIT 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. *Note: Course must be completed with a grade of C or higher to meet undergraduate graduation requirements. ***Prerequisites: BUS-457.*** (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 academic dean. This course may be repeated with different projects. ***Prerequisite: EN-102.*** (3-0-3)

CE-457 Senior Design Project I

Students/teams select a project, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements (constraints) and engineering, software, and/or security specifications, propose solutions and multiple designs, analyze proposed designs, and select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper systems engineering and project management to their work. Additional components may be required in some projects. Students/teams submit a final report at the end of the semester. ***Prerequisite: Senior standing.*** (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. ***Prerequisites:***

MA-114 (2-2-3)

CM-120 Introduction to Construction Management

This course will introduce the basic history and management concepts of the construction industry to students with the expectation that upon completion students will have an overview of the industry. Career choices, industry firms, and key players in the Construction Management process will be explored. (3-0-3)

CM-125 Construction Graph. & Plan Reading

This is an Introductory course designed to prepare students to identify, read and interpret construction drawings. The course will be delivered from an applied perspective with an emphasis on understanding the processes involved in construction and interpreting them from drawings. ***Prerequisite: CM-120 or FM-120.*** (3-0-3)

CM-220 Construction Methods and Materials

Vertical construction emphasizing comprehensive analysis of materials, design and specifications, installation methods, testing and inspection, and appropriate construction methodology for application. ***Prerequisite: CM-120 or FM-120 and MA-114*** (3-0-3)

CM-230 Estimating I

Introduction to the classification of work from plans and specifications. Covers discussion of the estimating function and review and applications of material quantity survey techniques used in estimating costs of construction projects. Includes types of approximate and precise methods of estimating and their uses, and computer applications. ***Prerequisite: CM-125*** (3-0-3)

CM-250 Legal Issues in Construction

An overview of standard construction contracts traditionally used between contractors, owners, design professionals and subcontractors from a general contractor's point of view. ***Prerequisites: CM-220*** (3-0-3)

CM-260 Statics and Strengths of Materials

This algebra-based course is the study of forces acting upon structural elements. Analytic and graphic methods are used to illustrate resultants and reactions, equilibrium, centroids and moments of inertia applied to static structures. Analysis includes stress, strain, axial loading, bending, and deflection of beams***. Prerequisite: MA-112 and PH-201.*** (3-0-3)

CM-270 Safety Management

Covers OSHA liability, general safety, hazard communication, fire, material handling, tools, welding, electricity, scaffolding, fall protection, cranes, heavy equipment, excavation, concrete, ladders and stairways, confined space entry, personal protective equipment, and health hazards. ***Prerequisite: CM-120 or FM-120*** (3-0-3)

CM-301 Construction Project Management

Courses

This course covers construction procedures and administration processes using the latest construction management technologies and methods to explain typical project management functions and documentation. ***Prerequisites: CM-250, CM-270, CM-330 and CM-350.*** (3-0-3)

CM-330 Estimating II

This course covers pricing and bidding of construction work, including cost factors, labor and equipment, productivity factors, prices databases, job direct and indirect costs, methods of estimating time, materials, equipment, subcontractors' work, general expenses, and profit, bid preparations and submission, and computer applications. ***Prerequisite: CM-230.*** (3-0-3)

CM-350 Construction Planning & Scheduling

This course focuses on construction scheduling software with plans and specifications that will be used in planning a construction project from start to finish. ***Prerequisite: CM-230.*** (3-0-3)

CM-375 Mechanical & Electrical Const.

An Introduction to the basics of mechanical, electrical, plumbing and fire protection systems (MEP) in construction. This includes installation of systems and the necessary resources. ***Prerequisite: CM-220.*** (3-0-3)

CM-380 Environmental Systems

This course is a comprehensive overview of environmental impact of common construction processes; and, environmental/occupational hazards and liability associated with those processes. ***Prerequisites: CH-120, CM-120, CM-250, and PH-201.***

CM-450 Management of Field Operations

This course is intended to equip students with knowledge and skills required to successfully manage and support construction field operations. Knowledge areas include contract administration, project engineering, site superintendence, and other topics critical to field operations. ***Prerequisites: CM-250, CM-270, CM-330 and CM-350.*** (3-0-3)

CM-457 Internship in Construction Management

Successful completion of an approved internship is a graduation requirement. The internship program complements classroom learning by exposing students to various construction management functions on real-life projects. ***Prerequisite: Sophomore Status.*** (3-0-3)

CM-458 Senior Project

The student proposes, designs, completes and construction management and critical infrastructure capstone project. Students write a report according to specifications and deliver an oral presentation for review. ***Prerequisite: CM-375, CM-301 and CM-450***. (3-0-3)

CM-800 Construction Science Research Background

The student will focus on the study of the latest Construction Science processes and developments. The student will synthesize the growing effect of technology on current operations, international relationships and effects on the field, and where there are areas of improvements or failings. The focus will be to start identifying areas for research at a later stage and explore the background. (6)

CM-810 Construction Science Research Mythologies

The student will evaluate and develop research methodologies and strategies suitable for Construction Science and address the data sources and information to test a hypothesis or research question. It is expected the student will be building upon CM-800 in refining and developing their research task and plan. ***Prerequisite: CM-800.*** (6)

CM-820 Construction Science Future Demands

The student will research the future demands Construction Science and how these influence specific research questions. Data collection and applications will be central to evaluating the needs of Construction Science on the short, medium and long term. ***Prerequisite: CM-810.*** (6)

CM-830 Strategies for Construction Science

The student will undertake a robust and comprehensive analysis of the strategies for the growth and evolution of Construction Science. Students will analyze the influences of economics, international politics, and sustainability that dictate planning based upon non- technical aspects. For example, how international disputes effect key resources, costs, and construction schedules. ***Prerequisite: CM-820.*** (6)

CM-840 Construction Science Research Proposal

The student will produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and a timing plan. The doctoral student will then complete the research milestones according to the proposal and research plan. ***Prerequisite: CM-830.*** (6)

CM-900 Construction Science Doctoral Writing I

The student will compose and complete Chapters 1 and 2 within the boundaries of the proposal and research plan. Chapters 1-2 will be reviewed by the student's Chair and Committee and must be approved for the student to advance. ***Prerequisite: CM-840.*** (6)

CM-910 Construction Science Doctoral Writing II

The student will compose and complete Chapter 3 within the according to the approved proposal. The student will also submit Chapters 1-3 to the Institutional Review Board (IRB) and Academic Review Board (ARB). After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. ***Prerequisite: CM-900.*** (6)

CM-920 Construction Science Doctoral Writing III

The student will compose and complete Chapter 4. The student will provide a complete and substantive presentation of the research results in Chapter 4. The student's Chair and Committee must review and approve Chapter 4 for the student to advance. ***Prerequisite: CM- 910.*** (6)

CM-930 Construction Science Doctoral Writing IV

The student will compose and complete Chapter 5 and submit the work to the student's Chair and Committee. The student will also finalize all required elements of their research. The student's Chair and Committee must review and approve the complete document. The student's Chair and Committee will then submit the complete document to the University Reviewers and Ph.D. Review Board for approval. The student must receive approval from the University Reviewers and Ph.D. Review Board to advance forward. ***Prerequisite: CM-920***. (6)

CM-940 Construction Science Doctoral Defense

Upon approval from the University Reviewers and Ph.D. Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through viva voce (i.e., oral examination). The student's Chair, Committee and Ph.D. Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. ***Prerequisite: CM-930.*** (6)

CYP-700 Fund of Graduate Research & Design

This course will introduce the fundamentals of graduate research and design. The project will focus on graduate level writing, APA style, and the fundamentals of scientific inquiry. The project will cover the areas of technology research, ethics of research, the stages of the research process, conceptualization and operationalization of research questions, data collection techniques, analytics, an introduction to qualitative and quantitative methods and measurement, a discussion of program evaluation research, and research proposal development. (6)

CYP-710 Ethics & Phil of Rsc & Data Collect

This course will address the ethics of conducting scholarly research. The discussion of research ethics will include, but not be limited to, informed consent, protecting anonymity of participants, and ethical participant protocols. Discussions will address the limits of researchers' obligations, along with providing a detailed look at the process of applying for Institutional Review Board approval. This project will provide students with an overview of the range of data collection methods available to individuals undertaking research and to enable the student to consider the implications, application strengths and weaknesses of the various data collection methods. The module will also provide insight into the ways that such methods may be applied effectively and ethically in research. (6)

CPY-715 Cyberpsychology Research Proposal

Under a Chair, a student will further research the future demands in the

Cyberpsychology field and how these influence specific research questions. Data collection and applications will be central to evaluating the needs of Cyberpsychology research on the short, medium and long term. The literature review will be more specific in focus and direction at this stage. The ARB will be completed at this stage. (6)

CPY-725 Cyberpsychology Rsch & Data Collect

The student will produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and include a timing plan. The student will then complete the research milestones according to the proposal and research plan. The IRB will need to be completed by this stage. (6)

CPY-735 Cyberpsychology Master's Defense

Upon approval from the University Reviewers and Master of Research Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through vim voce (i.e., oral examination). The student's Chair, Committee and Master of Research Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. (6)

CPY-800 Cyberpsychology Research Background

The student will focus on the study of the latest Cyberpsychology strategies, tactics and developments. The student will synthesize the growing effect of Cyberpsychology on current operations, international relationships and effects on the field, and identify areas for improvements or failings. The faculty will directly support and mentor the exploration phase of the planning. (6)

CPY-810 Cyberpsychology Research Methodologies

Under a Chair and committee, a student will continue evaluating and develop research methodologies and strategies suitable for understanding Cyberpsychology and address the data sources, information, and intelligence to test a hypothesis or research question. It is expected the student will be building upon CPY-800 in refining and developing their research task and plan. (6)

CPY-820 Cyberpsychology Future Demands

Under a Chair and committee, a student will further research the future demands in the Cyberpsychology field and how these influence specific research questions. Data collection and applications will be central to evaluating the needs of Cyberpsychology in the short, medium, and long term. The literature review will be more specific in focus and direction at this stage. (6)

CPY-830 Strategies for Cyberpsychology

The student will compose and complete Chapter 5 and submit the work to the student's Chair and Committee. The student will also finalize all required elements of their research. The student's Chair and Committee must review and approve the complete document. The student's Chair and Committee will then submit the complete document to the University Reviewers and Ph.D. Review Board for approval. The student must receive approval from the University Reviewers and Ph.D. Review Board to advance forward. (6)

CPY-840 Cyberpsychology Research Proposal

The student will produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and include a timing plan. The doctoral student will then complete the research milestones according to the proposal and research plan. The IRB and ARB will need to be completed by this stage. (6)

CPY-900 Cyberpsychology Doctoral Writing I

The student will compose and complete Chapters I and 2 within the boundaries of the proposal and research plan. Chapters 1-2 will be reviewed by the student's Chair and Committee and must be approved for the student to advance. The material for these chapters will have been established in the CPY 800 series. Any disagreement within the committee will be reviewed by the Dean of Doctoral Programs. (6)

CPY-910 Cyberpsychology Doctoral Writing II

The student will compose and complete Chapter 3 (methodology chapter that is robust and identifies all implications) according to the approved proposal. After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. (6)

CPY-920 Cyberpsychology Doctoral Writing III

The student will compose and complete Chapter 4. The student will provide a complete and substantive presentation of the research results in Chapter 4. The student's Chair and Committee must review and approve Chapter 4 for the student to advance. (6)

CPY-930 Cyberpsychology Doctoral Writing IV

The student will compose and complete Chapter 5 and submit the work to the student's Chair and Committee. The student will also finalize all required elements of their research. The student's Chair and Committee must review and approve the complete document. The student's Chair and Committee will then submit the complete document to the University Reviewers and Ph.D. Review Board for approval. The student must receive approval from the University Reviewers and Ph.D. Review Board to advance forward. (6)

CPY-940 Cyberpsychology Doctoral Defense

Upon approval from the University Reviewers and Ph.D. Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through viva voce (i.e., oral examination). The student's Chair, Committee, and Ph.D. Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. (6)

CRI-210 Critical Infrastructure I

This course will introduce participants to the key terms, policy, guidance, and preparedness efforts required to safeguard the Nation's critical infrastructure. Students will learn relevant policy and guidance, discuss the risk management framework, describe Federal critical infrastructure security and resilience and information sharing programs, and relate critical infrastructure programs to individual actions. Primary focus will be on incorporating Critical Infrastructure protection into construction of facilities in six of the sixteen critical infrastructure sectors: chemical facilities, commercial (e.g., retail, entertainment, lodging), communications facilities, critical manufacturing facilities, dams, and energy facilities. Students will complete hands-on Critical Infrastructure projects related to the construction of those types of facilities. (3-0-3)

CRI-310 Critical Infrastructure II

The national and economic security of the United States depends on the reliable functioning of critical infrastructure. This course examines collaboration efforts among the entities responsible for constructing physical and cybersecurity protection as well as the development of integrated risk management strategies for our Nation's critical infrastructure. Primary focus will be on incorporating Critical Infrastructure protection in to construction and renovation of facilities in five of the sixteen critical infrastructure sectors: Defense industrial facilities, emergency services facilities, financial services facilities, government facilities, and public healthcare facilities. Students will complete hands-on Critical Infrastructure projects related to the construction and renovation of those types of facilities. ***Prerequisite: CRI-210.*** (3-0-3)

CRI-410 Critical Infrastructure III

This course will explore how threats, vulnerabilities, and consequences determine risk as it relates to the protection of Critical Infrastructure. Primary focus will be on incorporating Critical Infrastructure protection into construction of facilities in five of the sixteen critical infrastructure sectors: food and agriculture facilities, Information Technology facilities, nuclear facilities, transportation facilities, and water/wastewater facilities. Students will complete hands-on Critical Infrastructure projects related to the construction, hardening, and recovery of those types of facilities. ***Prerequisite: CRI-310.*** (3-0-3)

CRI-501 Critical Infrastructure Introduction

The security and resilience of the 16 sectors of Critical Infrastructure is essential to the nation's security, public health and safety, economic vitality, and way of life. This course will present an overview of the National Infrastructure Protection Plan -- the unifying structure for the integration of existing and future critical infrastructure security and resilience efforts into a single national program. Students will learn the responsibilities of the federal government, state, local authorities, and private industry. The course will provide the skills and tools to effectively achieve results for critical infrastructure security and resilience through successful critical infrastructure partnership and collaboration. Relevant policies and guidance, risk management framework, federal Critical Infrastructure security and resilience, and information sharing programs will be covered in depth. (3)

CRI-510 CI 1 Perf & Risk Analysis of Infrastructure Systems

The national and economic security of the United States depends on the reliable functioning of Critical Infrastructure. This course presents a comprehensive systems approach to infrastructure asset management across areas of public and private infrastructure. Topics include the framework of integrated asset management illustrated in transportation, water and wastewater systems, the economic evaluation of infrastructure options, and using life cycle cost analysis (LCCA) and cost-benefit analysis (CBA). ***Prerequisite: CRI-501.*** (3)

CRI-520 CI 2 Security Management of Critical Infrastructure

This course will explore how threats, vulnerabilities, and consequences determine risk and the security management of Critical Infrastructure. Primary focus will be on the areas of vulnerability assessment and security management of critical infrastructure systems, including approaches to vulnerability analysis and critical infrastructure protection strategies. Critical infrastructure sectors include water supply/environmental, transportation, power and fuel systems, SCADA systems, cyber-infrastructure, telecommunications and public health. ***Prerequisite: CRI-510.*** (3)

CRI-710 Critical Infrastructure Capstone

The Capstone Project is the culminating effort of the student's entire learning experience. The student will complete a comprehensive exam that provides significant evidence of experience in Critical Infrastructure studies, master's level thesis and research project (with submission of a final report, approval by a thesis committee, and an oral defense of the research work), or a comprehensive Critical Infrastructure project. Students will work with designated faculty to formulate, develop, and complete the project, thesis, or exam. The completion of the Capstone Course is designed to document significant evidence that all Program Outcomes have been met and provides the student evidence of experience to show to current and prospective employers. The Capstone Course must be taken at the end of the student's degree program. Prerequisite: All Master of Science in Critical Infrastructure degree program curriculum below the 700 level. (3)

CRI-800 CI Systems and Facilities

The student will focus on the study of Critical Infrastructure within the context of technology and related political, social and cultural aspects of security. The focus is on the systems and facilities which have become the nervous system of modern cities and nations and whose disruption can trigger dramatic crises. Not only external threats (such as natural disasters, terrorist attacks and cyberattacks) are threatening the 16 sectors of Critical Infrastructure, but also the growing complexity and interconnectedness of the systems. The student will analyze, evaluate, and integrate alternate, divergent, and contradictory perspectives and solutions to protect Critical Infrastructure. The student will also explore the interdependence of multiple spatial and temporal relationships that exist within and between sectors. (6)

CRI-810 CI Construction and Function

The student will delve deep into the construction and function of Critical Infrastructure. After advanced study on construction techniques and functional requirements in each Critical Infrastructure sector, the student will research how the construction of facilities in one of the 16 sectors meets the functional needs of its customers while exposing its dependencies and vulnerabilities. Among the deliverables, the student will produce an abstract and notable paper showing significant research within their chosen sector. ***Prerequisite: CRI 800.*** (6)

CRI-820 Threats to Critical Infrastructure

The student will analyze and evaluate in depth the full array of threats to Critical Infrastructure. All forms of threats, from natural disasters to terrorist attacks to cyberattacks, will be examined. The student will also conduct advanced study and research on the threats to one of the 16 sectors of Critical Infrastructure. Among the deliverables, the student will produce an abstract and notable paper showing significant research on the threats to their chosen sector. ***Prerequisite: CRI 810.*** (6)

CRI-830 Strategies for Critical Infrastructure Protection & Resilience

The student will undertake a robust and comprehensive analysis of the strategies for preparation, protection, and resilience of Critical Infrastructure within all 16 sectors. The student will draw data supported conclusions and develop a comprehensive strategy for one of the 16 sectors of Critical Infrastructure. The strategy will be informed by the construction, function, dependencies and vulnerabilities that exist. ***Prerequisite: CRI-810.*** (6)

CRI-850 Critical Infrastructure Path Forward

The student will produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and a timing plan. The doctoral student will then complete the research milestones according to the proposal and research plan. ***Prerequisite: CRI-830.*** (6)

CRI-900 Critical Infrastructure Doctoral Writing I

The student will compose and complete Chapters 1 and 2 within the boundaries of the proposal and research plan. Chapters 1-2 will be reviewed by the student's Chair and Committee and must be approved for the student to advance. ***Prerequisite: CRI-850.*** (6)

CRI-910 Critical Infrastructure Doctoral Writing II

The student will compose and complete Chapter 3 within the according to the approved proposal. The student will also submit Chapters 1-3 to the Institutional Review Board (IRB) and Academic Review Board (ARB). After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. ***Prerequisite: CRI 900***. (6)

CRI-920 Critical Infrastructure Doctoral Writing III

Courses

The student will compose and complete Chapter 4. The student will provide a complete and substantive presentation of the research results in Chapter 4. The student's Chair and Committee must review and approve Chapter 4 for the student to advance. ***Prerequisite: CRI 910.*** (6)

CRI-930 Critical Infrastructure Doctoral Writing IV

The student will compose and complete Chapter 5 and submit the work to the student's Chair and Committee. The student will also finalize all required elements of their research. The student's Chair and Committee must review and approve the complete document. The student's Chair and Committee will then submit the complete document to the University Reviewers and Ph.D. Review Board for approval. The student must receive approval from the University Reviewers and Ph.D. Review Board to advance forward. ***Prerequisite: CRI 920.*** (6)

CRI-940 Critical Infrastructure Doctoral Defense

Upon approval from the University Reviewers and Ph.D. Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through viva voce (i.e., oral examination). The student's Chair, Committee and Ph.D. Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. ***Prerequisite: CRI 930.*** (6)

CTR-600 Introduction to Terrorism and Counterterrorism

An overview of terrorism in the modern era, ranging from how to define terrorism, the history and evolution of modern terrorism, significant terrorist groups, motivations and ideologies, root causes, radicalization and recruitment, organizational patterns, leadership types, modus operandi, funding, targeting patterns and significant areas of operations, ranging from "physical" to cyberspace. International and domestic terrorism will be discussed. An overview of counterterrorism and core concepts, such as the components of anti-terrorism and counter-counterterrorism, measures of effectiveness, the role of strategic surprise in terrorist and counterterrorist operations. Prerequisite: None. (3)

CTR-610 Methods of Terrorists

The course examines the methods, tactics, techniques, and procedures employed by terrorist groups to conduct attack planning, funding, radicalization, recruitment, organizational formations (group and lone actors), decision making and targeting, agendas, propaganda, logistics, operations on the "ground" and in cyberspace, and the spectrum of weapons used by terrorists, ranging from 'conventional', cyber, to weapons of mass destruction and other technological innovations. The case study method will be used to analyze these issues, including analyzing significant terrorist operations. Prerequisite: CTR-600. (3)

CTR-620 Elements of Counterterrorism

This course addresses the components of counterterrorism conceptually, such as, anti-terrorism and counter-terrorism, and the roles of components such as those that are political, law enforcement, military, intelligence, and socio-economic. It will introduce the students to counterterrorism measures such as how to respond to terrorist outbreaks in the form of integrated campaigns that incorporate measures such as how to understand the nature of a terrorist adversary, the root causes that might underlie an insurgency, how to map the trajectory into violence, how to counter terrorist groups and lone actors, how to formulate counter violent extremism campaigns (including deradicalization, disengagement, and rehabilitation of terrorists from violence), and how to counter terrorism on the Internet. The course would also present metrics used in formulating measures of campaign effectiveness, campaign end-states, and best practices in how terrorist insurgencies are terminated. Using the case study method, significant terrorism case histories will be analyzed, such as in Northern Ireland, the Israelis and Palestinians, countering al Qaida and ISIS, as well as domestic cases in the United States). Prerequisite: CTR-610. (3)

CTR-630 Methods of Counterterrorism

This course will examine the components of anti-terrorism and counter-terrorism, domestically and internationally. It will focus on significant government agencies involved in countering terrorism, with a primary focus on how the U.S. Government is organized to address the terrorism threat at the national and local levels, domestically and internationally. The components of countering violent extremism will also be discussed. Using the case study method, it will examine significant terrorist adversaries and governmental responses to their attacks. The responses of several U.S. allies will also be examined for comparison purposes. The program's overall concepts will be applied to assess programmatic effectiveness and lessons learned. The components of target hardening and other defensive measures, as well as upgrading societal resilience in responding to terrorist threats will also be covered. Prerequisite: CTR-620. (3)

CTR-640 Tools and Techniques of Counterterrorism

This course focuses on significant methodologies and technological tools that are employed in counterterrorism, with each weekly module applying each one to a different counterterrorism topic. Beginning with an overview on the use of technologies in counterterrorism, relevant methodologies and tools will be applied and operationalized, such as Analyst's Notebook, Social Network Analysis, Excel, Root Cause Analysis, Enterprise Security Risk Management, Metrics of Programmatic Effectiveness, Forecasting Methodologies, Datamining, Protective Intelligence Platforms, Artificial Intelligence, and others. Prerequisite: CTR-630. (3)

CTR-680 Seminar in Terrorism and Counterterrorism

Students will review counter-terrorism-related Enterprise Security Risk Management (ESRM) methodologies and the approaches to identifying and prioritizing assets, risks, and mitigations that provide a return on investment (ROI). This will be based on the formula of Risk = Threat, Vulnerability, and Consequence. Leading experts in industry and government will be featured lecturers. Students will learn to effectively apply security risk management methodologies as a tool in their daily work. Prerequisite: Next to last course in degree program. (3)

CTR-705 Counterterrorism Capstone Project

The final course in the program is a practicum, with the students writing a thesis in which they apply one or more of the counterterrorism software tools to analyze and effectively communicate how to resolve a significant terrorism case. Prerequisite: Last course in degree program. (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-120 Introduction to Programming Using Python

The course will cover basic concepts and elements of computer programming using Python. Topics include variables, constants, operators, expressions, statements, branching, loops, and functions. Additionally, Python specific data structures, built-in functions, library modules and working with external files will be applied in developing working code. ***Prerequisite: none***

CS-130 Introduction to Programming Using Java

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- 110. MA-112 or MA114.*** (3-2-3)

CS-150 Programming in 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. ***Prerequisite: MA-111 or MA-112 and CS-120 or placement test or CS-120. Formerly titled Introduction to Programming Using C.*** (3-2-3)

CS-200 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 in a modern relational database management system. An overview of database administration, transactions and concurrency. Data warehouses. Projects, which are assigned as homework, are implemented in Oracle. ***Prerequisite: CS-120, CS-130, or CS-150. 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 Data Structures

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-225 or CS-200. Corequisite: MA-124.*** (3-0-3)

CS-240: Introduction to Data Mining

This course will introduce basic concepts of data mining including data exploration, preparation, supervised and unsupervised learning algorithms, model evaluation and deployment. Students will learn to utilize one or more tools used in data mining to apply their learned data mining techniques to such problems as predictive modeling. ***Prerequisite: CS-120 Introduction to Programming Using Python or CT-206 Scripting Languages.***

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-230.*** (2- 2-3)

CS-300 Secure Coding

This course introduces the secure coding process including designing secure code, writing code that can withstand attacks, and security testing and auditing techniques to detect secure coding weaknesses. The course focuses on the security issues a programmer faces including, but not limited to, common code security weaknesses and modern security threats. The course explores core secure coding principles, strategies, coding techniques, and tools that aid programmers in developing more resilient and robust code. Students will develop and analyze C language code that demonstrates mastery of these secure coding principles. The course will also rely on industry standards and best practices such as SEI-CERT coding standards and OWASP top 10 web application security risks***. Prerequisite: CS-250.*** (3-0-3)

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: CS-225 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, etc.) Course requires written programming assignments. ***Prerequisites: CS-130 and MA-124. Offered spring 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 a modern relational database management system. ***Prerequisite: CS-220 and CT152.*** (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. ***Prerequisite: CS-150 and 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-341 3-D Asset Creation

Students learn how to create 2D and 3D graphics and sound files for use in animation and game design. ***Prerequisites: CS-150 or CS-130.*** (2-0-2)

CS-350 Data Visualization

This course will introduce best practices and industry standards for data visualization. The students will learn topics such as effective graphical representation of big data, unbiased data representation, exploratory data analysis, and interactive and sharable visualization. ***Prerequisite: CS-220 Database Management.***

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 ina 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. ***Prerequisites: CS-220 and CS225 or CS-230 and CS-200***. (3-0-3)

CS-360: Text Mining and Natural Language Processing

In this course, students will be introduced to a variety of basic principles, and techniques involved in carrying out of data mining on textual datasets or textual attributes. Topics include document representation, tokenization, parsing, text categorization, text clustering, topic modeling, and sentiment analysis. Concepts of Natural Language Processing (NLP) and Information Retrieval (IR) relevant to text mining will also be covered. ***Prerequisite: CS-240.***

CS-370: Computer Vision

This course provides an Introduction to computer vision. The topics will cover basics of image processing, segmentation, edge/line detection and object recognition. The students will also learn applications of these techniques to various application domains which can include some of the following: surveillance, traffic and road recognition, medical imaging, affective computing, visual tracking, and activity monitoring. ***Prerequisite: CS-120 or CT-206 or CS-150.***

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 academic dean. 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 Objectriented 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 or CS-200.*** (3-0-3)

CS-406 Requirements and Resource Analysis

Requirements analysis is crucial to avoid failure of a system or project. The requirements should be well documented, measurable, verifiable, plausible to fulfill, easy to keep track of and precise. Students will learn to identify stakeholders and elucidate needed information from them to formulate software requirement specification agreements, as well as examine the resources and skill sets needed to support the requirements. Among the strategies studied will be: goal modeling, software prototyping, and use case development. ***Prerequisite: CS-225 or CS-230 or CS-200.***

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-412 Design of Cloud Networks & Services

This course will help students understand the design and architecture of networks and network services that enable the delivery of business-grade cloud services. Students will understand how virtualized data-center infrastructure lays the groundwork for cloud-based services, automated self-service portals, how to classify cloud services and deployment models, and understand the actors in the cloud ecosystem. Students will review the elements, requirements, challenges, and opportunities associated with network services in the cloud, optimize data centers via network segmentation, virtualization-aware networks, virtual network services, and service overlays, and systematically secure cloud services. Students will learn about the crucial role of organizations such as Federal Risk and Authorization Management Program (FedRAMP), National Institute of Standards and Technology (NIST), Cloud Security Alliance (CSA), and the International Standards Organization (ISO) in creating standards.

Students will be challenged with cutting-edge hands-on labs from leading cloud vendors and a major cloud project. Students will ,also learn about containerization and micro services. This course is appropriate for Computer Science, Engineering and Cyber Security majors. Also cross-listed as CS-412/71 3. ***Prerequisite: instructor permission.*** (3-0-3)

Courses

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, CT-152, CS-230 and senior status.*** (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-230.*** (3-0-3)

CS-431 Graphics & Game Programming

Students learn how to develop and build a game using an industry-standard game engine such as Unity. 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 and PH-201 or PH-261***. (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-440: Advanced Machine Learning

This course will provide coverage of advanced machine learning algorithms and their applications. Topics include supervised and semi-supervised learning, neural networks, deep learning, reinforcement learning and the applications of advanced machine learning techniques to image, text and stream processing. ***Prerequisite: CS-240 OR CS-360.***

CS-452 Agile Methods for Software Engineering

Modern alternatives to traditional software engineering project management which promote collaboration between self-organizing/cross-functional teams, adaptive planning, evolutionary development, early delivery, and continuous improvement. Students will explore several popular agile processes and frameworks which may include some of the following, amongst others: Adaptive Software Development, Agile Unified Process, Crystal Clear Methods, Extreme programming, Lean, Scrum. Benefits and pitfalls of this approach as compared to more traditional models will be discussed. ***Prerequisite: CS-225 or CS-230 or CS-200.***

CS-457 Senior Design Project I

Students/teams select a project, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements (constraints) and engineering, software, and/or security specifications, propose solutions and multiple designs, analyze proposed designs, and select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper systems engineering and project management to their work. Additional components may be required in some projects. Students/teams submit a final report at the end of the semester. ***Prerequisite: Senior standing.*** (3-0-3)

CS-458 Senior Design Project II

Students/teams build and test their selected designs (completed in 457). Each student team delivers a tested prototype and defends its project in front of a panel of experts. Students/ teams submit a final report that includes description of the design, realization, and test processes as well as test results, discussion, and conclusion. Failure to deliver a completed design and a working prototype that meets engineering, software, and/or security specifications by the end of the semester may result in failing the course. Note: Course must be completed with a grade of C or higher to meet undergraduate graduation requirements. ***Prerequisite: CS-457*** (3-0-3)

CS-501 Introduction to Python Programming

The Python programming course will assist students with their understanding of the application, programming, and analytical use of Python as a means to making intelligent decisions based on the results of pulling and parsing through big data. Python is typically used for sorting and analyzing large data files and evaluating online sites to illustrate the larger issue of any type of research project or study. The fast pace of never ending digitalized data and emerging technology research makes Python programming language the ideal resource for collecting and presenting such vast amounts of data in a sensible and easy to understand format. (3)

CS-502 Predictive Analytics

In this course students will learn the data mining and data science methodologies and technologies needed to implement a predictive analytics solution in a given problem domain. The course will emphasize supervised learning techniques, but will also introduce and overview machine learning concepts in general. Students will learn the hands-on techniques to implement data preparation, model building, model evaluation and model deployment, using the leading industry language Python. Students will demonstrate an ability to apply predictive analytics techniques to a given problem. Students should be familiar with a high-level programming language, preferably Python. (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 Introduction to Software Design with UML

Object Oriented principals 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-506 Requirements and Resource Analysis

Requirements analysis is crucial to avoid failure of a system or project. The requirements should be well documented, measurable, verifiable, plausible to fulfill, easy to keep track of and precise. Students will learn to identify stakeholders and elucidate needed information from them to formulate software requirement specification agreements. They will learn how to perform goal modeling, software prototyping, and use case development, so that they can identify and document Architectural Requirements, Structural Requirements, Behavioral Requirements, Functional Requirements, Performance Requirements, and Derived Requirements, amongst others. They will also examine the resources and skill sets needed to support the requirements. (3)

CS-507 Database Systems Implementation

The course introduces DBMS (Database Management System) architecture and implementation issues such as storage structures, multidimensional index structures, concurrent access, data warehousing, and business intelligence. NoSQL concepts, including MongoDB are also introduced. (3)

CS-510 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. (3)

CS-511 Statistical Methods on Data Science

This course introduces numerical methods and statistics as a discipline of analyzing data i.e. estimating errors, modeling relationships between two or more variables, interpretation of the results. Concepts of machine learning and big data analytics will be introduced. Students will use industry standard tools like R and SAS. (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 grammars; 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-551 Software Testing

This course covers the concepts and methodologies required for software testing and deployment. Topics include unit testing, module testing, subsystem and system level testing; coverage criteria, manual and automated techniques for test validation and data generation; formal testing processes and standards; black box vs. white box testing; functional testing; and testability analysis. Students will also learn to use profilers, practice advanced features of popular debugging tools, learn to use version control software such as SVN and GIT, and build tools like Ant, Maven and Gradle. (3)

CS-552 Agile Methods

Agile is an alternative to the traditional waterfall approach discussed in other software engineering courses. Its key principals include: active user involvement in the design process, empowering the development team to make decisions, allowing requirements to evolve while keeping the timescale fixed, iterating with small/incremental releases, testing early and often, and high degree of collaboration between all stakeholders. Students will explore several popular agile processes and frameworks which may include some of the following, amongst others: Adaptive Software Development, Agile Unified Process, Crystal Clear Methods, Extreme programming, Lean, Scrum. Benefits and pitfalls of this approach as compared to more traditional models will be discussed. (3)

CS-575 Secure Coding

This course introduces the secure coding process including designing secure code, writing code that can withstand attacks, and security testing and auditing techniques to detect secure coding weaknesses. The course focuses on the security issues a programmer faces including, but not limited to, common code security weaknesses and modern security threats. The course explores core secure coding principles, strategies, coding techniques, and tools that aid programmers in developing more resilient and robust code. Students will develop and analyze C language code that demonstrates mastery of these secure coding principles. The course will also rely on industry standards and best practices such as SEI-CERT coding standards and OWASP top 10 web application security risks. ***Prerequisite: Permission for graduate students.*** (3)

CS-604 Accelerated and Parallel Computing

Many of the key emerging application areas of computing such as artificial intelligence, machine learning, blockchain applications and cryptographic systems are dependent on accelerated and highly parallelized computing systems and architectures. Current and future application advances will require such technologies as graphics processing units (GPUs) and other parallel chip and system architectures. In this course students will learn the underlying concepts and architectures of parallel and accelerated computing systems and gain exposure to specific development technologies such as CUDA programming for GPUs. Students should be familiar with a high-level programming language such as C and basic computer architecture. (3)

CS-605 Intelligent Automation

This course covers various business and technical aspects of intelligent automation, including its motivations, benefits, detriments, tools, and techniques. The mixture of robotic process automation (RPA), machine learning engineering, and low-code techniques shows students how to maximize automation while minimizing complexity. Students will demonstrate the ability to evaluate and apply intelligent automation techniques to one or more given problems. Pre-requisites: CS-502 or instructor permission. (3)

CS-610 Machine Learning & 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. CS-511 recommended. (3)

CS-620 Operating 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) ***Note: This course is not an approved elective for the MSCS program.***

CS-701 Artificial Intelligence

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 Multithreaded & 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

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. ***CS-511 recommended.*** (3)

CS-711 Computer Vision and Deep Learning

This course will cover modern developments in computer vision and image processing, particularly the use of machine learning and deep learning technologies to achieve solutions to computer vision problems. The course covers relevant deep learning approaches including convolutional neural networks and other deep learning approaches, and students will learn how to apply these technologies to a given problem in the computer vision domain. Pre-requisite: CS-502 Predictive Analytics

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. (3)

CS-713 Design of Cloud Networks & Services

This course will help students understand the design and architecture of networks and network services that enable the delivery of business-grade cloud services. Students will understand how virtualized data-center infrastructure lays the groundwork for cloud-based services, automated self-service portals, how to classify cloud services and deployment models, and understand the actors in the cloud ecosystem. Students will review the elements, requirements, challenges, and opportunities associated with network services in the cloud, optimize data centers via network segmentation, virtualization-aware networks, virtual network services, and service overlays, and systematically secure cloud services. Students will learn about the crucial role of organizations such as Federal Risk and Authorization Management Program (FedRAMP), National Institute of Standards and Technology (NIST), Cloud Security Alliance (CSA), and the International Standards Organization (ISO) in creating standards.

Students will be challenged with cutting edge hands on labs from leading cloud vendors and a major cloud project. Students will also learn about containerization and micro services. This course is appropriate for Computer Science, Engineering and Cyber Security majors. Also crosslisted as CS-412/71 3. ***Prerequisite: instructor permission***.

(3)

CS-714 Computer Science Seminar

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. Prerequisite: completion of at least 18 credit hours of graduate coursework. (3)

CS-716 Advanced Artificial Intelligence

This course covers selected deep learning and deep neural network technologies, drawn from such topics as convolutional neural networks, recurrent neural networks and generative models. The course will combine coverage of relevant technologies with consideration of emerging innovations and developments in this field. Pre-requisite: CS-502 Predictive Analytics (3)

CS-755 Introduction to Python Programming

The Python programming course will assist students with their understanding of the application, programming, and analytical use of Python as a means to making intelligent decisions based on the results of pulling and parsing through big data. Python is typically used for sorting and analyzing large data files and evaluating online sites to illustrate the larger issue of any type of research project or study. The fast pace of never ending digitalized data and emerging technology research makes Python programming language the ideal resource for collecting and presenting such vast amounts of data in a sensible and easy to understand format. (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, pre-calculus. 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. ***Prerequisite: CS-120 or placement test.*** (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 and Python. 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-120, CS-130, or CS-150.*** (3-0-3)

CT-240 Internetworking with Routers/Switches

Configuring routers and switches to build multiprotocol inter-networks such as RIP, EIGRP, OSP and BGP. VLAN and VLAN trunking also be included. In addition, Point to point protocols, encapsulation and VPN will be part of the hands-on labs. Security topics that include the implementation of firewalls and mitigating threats via various authentication techniques will be part of the lab work. ***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 Enterprise Java frameworks, which may include: Java Servlets, Java Server Pages, Java Server Faces, Web Services, Java Persistence API, among others. Students will use the Model-View-Controller design pattern to produce N-tier applications. These applications will be build on top of a modern Web Server and Relational Database Management System. ***Prerequisites: CS-220 and CS-225 or CS-200 or CS- 230.*** (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. (6)

DSM-905 Org Chg & Info Sys Implementation

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 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 Analysis

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 Stats & Vis for Analytics

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 & Analytic Sys

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.***

DSM-929 Strategic Management

This course introduces strategy as a key function of management and leadership. Students will explore strategy from both the theoretical and practical vantage points. Students will be introduced to a variety of literature that serves as a foundation for developing a sound understanding of the strategy-related dilemmas that leaders face.

DSM-940 Web Analytics

The focus of this class is on developing a performance measurement system for the digital channel, incorporating both on-site and off-site analytics. Key performance indicators will be tied to internet marketing goals and tactical campaigns, Students will conduct a review of online metrics, compare analytics vendors, and develop a performance tracking system and a management dashboard report. (3)

DSM-945 Optimization Techniques for Mgmt Decisions

This course seeks to enable the students to develop the ethical leadership strategies and communication skills needed to motivate and mobilize co-workers so all can achieve core business goals. The theoretical framework for the course will be drawn from histories' great military and political leaders. The practice will involve the participants in competing and cooperating with their peers to maximize development of the resources their unit needs to grow and succeed. The exercises will enhance negotiation skills and self-insights into each participant's ethical world view. (3)

DSM-955 Introduction to Python Programming

The Python programming course will assist students with their understanding of the application, programming, and analytical use of Python as a means to making intelligent decisions based on the results of pulling and parsing through big data. Python is typically used for sorting and analyzing large data files and evaluating online sites to illustrate the larger issue of any type of research project or study. The fast pace of never ending digitalized data and emerging technology research makes Python programming language the ideal resource for collecting and presenting such vast amounts of data in a sensible and easy to understand format. (3)

DSR-881 Special Topics in Research

This course provides students the opportunity to examine in-depth issues relevant to their research. This course may result in a publishable paper. (3)

DSR-882 Special Topics in Research II

This course provides students the opportunity to examine in-depth issues relevant to their research. This course may result in a publishable paper. (3)

DSR-88 3 Special Topics in Research III

This course provides students the opportunity to examine in-depth issues relevant to their research. This course may result in a publishable paper. (3)

DSR-884 Special Topics in Research IV

This course provides students the opportunity to examine in-depth issues relevant to their research. Students must request a faculty member who is a topic specific expert to facilitate the course. This course may result in a publishable paper. (3)

DSR-900 Writing the Doctoral Dissertation

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

DSR-925 Dissertation Preparation I

(Residency) Students will generate significant portions of the dissertation proposal and receive faculty feedback on completed sections. ***Prerequisite: RSC-812.*** (3)

DSR-930 Management & Security of 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 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

DSC Cybersecurity students complete the dissertation milestones developed by the student and the mentor. Students who are not prepared to defend after completing DSR-9 35 must enroll in RSC-899. ***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 Preparation I

Assists PhD Business Analytics and Decision Sciences students through the proposal and dissertation writing processes. ***Prerequisite: DSR-930.*** (3)

DSR-950 Dissertation Presentation & Oral Defense

DSc Cybersecurity learners prepare the dissertation for publication. Learner research is examined through an oral defense. ***Prerequisite: DSR-9 35.*** (3)

DSR-952 Dissertation Research II

This course is a continuation of research in preparation for the submission of a doctoral dissertation proposal.

DSR-953 Dissertation Research III

This course is a continuation of research in preparation for the submission of a doctoral dissertation proposal.

DSR-960 Dissertation Pres. & Oral Defense

PhD Business Analytics 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-285 Prog. Logic Controllers & Networks

Introduces programmable logic controllers (PLCs). Emphasizes ladder diagrams and programming of PLC. Introduces network systems such as DeviceNet, ProfiNet, and ProfiBus. Emphasizes the integration of PLCs in automation systems. Two hours lecture and three hours laboratory. ***Prerequisites: EL-200.*** (3-0-3).

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 converters. 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-340 Systems Engineering

An interdisciplinary course with both technical and management aspects of large, multifaceted engineering projects. Special emphasis placed on design, implementation, and improvement of mechatronic systems. Topics include systems engineering, engineering management, economics, quality control and engineering, project management, production systems planning and operations, and human factors. ***Prerequisites: EL-215, BUS-301.*** (3-0-3)

EE-353 Power Systems 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: EL-150 or 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. Serial 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: EL-204. 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-403 Environment/Renewable Energy Systems

Teaches the students theory and practice for direct production of electricity from alternate energy sources such as solar, wind and geothermal. Course material includes characteristics of direct energy conversion, and storage devices used in alternate energy sources. Impact of solar heating and lighting on building design is also introduced. Concepts of engineering economics are discussed as well. This course will expose students to concepts applied in electrical, civil and mechanical engineering and architecture. ***Prerequisite: Senior status.*** (3-0-3)

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. Laplace and Fourier transforms and their properties. ***Prerequisite: MA-262 and MA-340. 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. ***Prerequisite: EE-309.***(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-340*** (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: EE-406. Offered during spring semester only.*** (2-2-3)

EE-457 Senior Design Project I

Students/teams select a project, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements (constraints) and engineering, software, and/or security specifications, propose solutions and multiple designs, analyze proposed designs, and select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper systems engineering and project management to their work. Additional components may be required in some projects. Students/teams submit a final report at the end of the semester. ***Prerequisite: Senior standing.*** (3-0-3)

EE-458 Senior Design Project II

Students/teams build and test their selected designs (completed in 457). Each student team delivers a tested prototype and defends its project in front of a panel of experts. Students/ teams submit a final report that includes description of the design, realization, and test processes as well as test results, discussion, and conclusion. Failure to deliver a completed design and a working prototype that meets engineering, software, and/or security specifications by the end of the semester may result in failing the course. *Note: Course must be completed with a grade of C or higher to meet undergraduate graduation requirements. ***Prerequisite: EE-457.*** (3-0-3)

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. ***Prerequisites: PH-263 and MA-340 Offered during spring semester only. (***3-0-3)

EE-460 Electromagnetic Fields

Stationary electric and magnetic fields. Gauss's Law, Laplace and Poisson's equations. Solutions to static field problems. Ampere's Law, Faraday's Law. Time-varying electric and magnetic fields. Boundary conditions. Maxwell's equations and applications to wave phenomena. ***Prerequisites: PH-263 and MA-340.*** (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 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 an appropriate software tool are introduced. (3)

EE-601 Modern Circuit Design & 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 & 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-630 Electro Optics

Solid state theory of optoelectronic devices; photo-emitters; photodetectors; light emitting diodes; lasers; laser diodes; solar cells; displays; electro-optic modulators; integration and application of electro-optical components in electro-optical systems of various types. (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 & 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 & 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 & 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. (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. (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, and deliverables. 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: Completion of at least 18 credit hours of graduate coursework. (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. MATLAB Part I: Introduction to MATLAB, variables, MATLAB functions, data types, writing a MATLAB program, using basic plotting functions. ***Corequisite: MA-112.*** (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. MATLAB Part II: input and output statements, importing data from spreadsheets, text files and other formats into MATLAB, conditional statements, loops, arrays, array functions. ***Prerequisites: EL-100 Corequisite: MA-114 or MA-114 Placement Test equivalent or MA- 261 or MA-261 Placement Test equivalent***. (2-2-3)

EL-200 Electronic Devices & Circuits

Principles and characteristics of semiconductor devices. Devices covered include diodes, Zener diodes, bipolar junction transistors, field-effect transistors, and

Courses

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-150 or EE-159.*** (2-2-3)

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-210 RF Fundamentals

This course covers RF fundamentals. Topics will include transmitting and receiving electromagnetic waves, radiation patterns, thermal noise, codes and standards related to antennas, installation practices, RF safety, and troubleshooting. ***Prerequisite: EL-261.*** (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-150 or EE- 159.*** (1-4-3)

EL-240 Mobile & Cellular Comm Systems

The course is designed to give the student the theory and technologies generally used in mobile communications. Topics covered include modulation, transmission, demodulation, antennas and propagation loss, interference, and system performance. Cell structure and frequency re-use. Digital signaling principles. Channel access in cellular systems. System aspects of current mobile systems: 2G (GSM), 2.5G (GPRS, EDGE) and 3G (UMTS, HSDPA), GERAN and UTRAN, Long Term Evolution (LTE). ***Prerequisite: EL-210.*** (2-2-3)

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. MATLAB Part III: using Simscape Electronics for modeling integrated circuits such as operational amplifiers. ***Prerequisites: EL-200.*** (3-2-3)

EL-255 Introduction to Control and Robotic

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-200.*** (2-2-3)

EL-261 Introduction to Comm Circuits & 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. MATLAB Part IV: using Communications System Toolbox for analysis, design, simulation and verification of communication systems. ***Prerequisites: 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-285 Programmable Logic Controllers and Networks

Introduces programmable logic controllers (PLCs). Emphasizes ladder diagrams and programming of PLC. Introduces network systems such as DeviceNet, ProfiNet, and ProfiBus. Emphasizes the integration of PLCs in automation systems. Two hours lecture and three hours laboratory. ***Prerequisites: EL-200***. (3-0-3).

EL-301 Advanced Comm Circuits & 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-340 Systems Engineering

An interdisciplinary course with both technical and management aspects of large, multifaceted engineering projects. Special emphasis placed on design, implementation, and improvement of mechatronic systems. Topics include systems engineering, engineering management, economics, quality control and engineering, project management, production systems planning and operations, and human factors. ***Prerequisitee: BUS-301.*** (3-0-3)

EL-353 Power Systems 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: EL-150 and MA-261***. (3-0-3)

EL-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-340*** (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 or CS-150. Offered during spring semester only.*** (2-2-3)

EN-001 Basic Writing Skills

Course in 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 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, SQ 3R, 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 demonstrate competence in writing mechanics, including grammar, sentence structure, logical content development, and research documentation through 4 essays/research papers. Rhetorical modes may include description, comparison/ contrast, narrative, and process analysis. Students are expected to develop effective oral communication skills through speeches. Group projects will develop effective team skills such as decision-making, time management, and cooperation. ***Prerequisites: acceptance based on placement test scores.*** (3-0-3)

EN-102- English Communications II

This sequel to EN-101 involves more sophisticated reading, writing, speaking, and research assignments. Students must demonstrate competence in writing mechanics, as well as advanced research skills, the ability to handle complex information, and effective team skills. Students write research papers: an information paper, a cause and-effect paper, an argument paper, and a final research paper. Course includes group work. Presentations are required. ***Prerequisite: EN-101.*** (3-0-3)

EN-408 Writing Seminar in Tech 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)

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 Comm 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)

FM-120 Introduction to Facilities Management (3 Credits)

This course examines the scope of the professional facilities manager's responsibilities. The Facility Manager's role in relation to an organization's overall plan. An overview is provided of the fundamental concepts in facilities management and a general understanding of the responsibilities of the profession as to why it is valuable to facility managers. The type of facilities associated with critical infrastructures will be covered. An overview of concepts needed to organize, monitor, communicate and develop a good facilities management program will be introduced. ***Pre-requisite: None*** (3-0-3)

FM-260 Facilities Management Leadership & Strategy

Understanding the strategic planning and alignment with the demand of the organization, the policies, procedures, and compliance of operations, team management, leadership styles, relationship management, conflict management, change management will be covered. Discussions will also cover political, social, economic and industry factors and corporate responsibility in a facilities management position. ***Pre-requisite: FM-120*** (3-0-3)

FM-280 Facilities Occupancy, Human Factors, Performance and Quality

An overview of workplace environment, occupant services, occupant health, safety, security, performance management and quality management. Topics covered in this course include occupancy, workplace environment, occupant services, occupant health, stakeholder expectations, measurable performance results and quality management. ***Pre-requisite: FM-260*** (3-0-3)

FM-301 Facilities Project Management and Finance

Planning, design, execution, delivery, and evaluation of project management as it relates to facilities. Scheduling, budgeting/estimating, contract administration, procurement, financial analysis and reporting, operational and capitol budgeting, and identifying a team to manage the facilities will be introduced. ***Pre-requisite: CM-250 and FM-260*** (3-0-3)

FM-330 Building Operations and Maintenance

An examination of how facilities, building operations, and maintenance organizations are managed. Topics include buildings, building systems, infrastructure, grounds, furniture, fixtures, equipment, physical safety and security, operations, maintenance, work management systems, and renovations ***Pre-requisite: CM-375*** (3-0-3)

FM-350 Facilities Assessment & Forecasting

This course emphasizes the strategic role required of the facilities manager who is responsible for the delivery of services and for preserving and maintaining the building structures, interiors and exteriors that house the technology infrastructure. Topics will include needs assessment, technology implementation, data collection, information management, maintenance and upgrade of technology, information security aspects, and information system. ***Pre-requisite: CM-375 and IAE-250*** (3-0-3)

FM-380 Facilities Energy and Sustainability

An overview of how facilities, building operations, and maintenance organizations are managed to meet the organization's social responsibilities and maintain compliance with laws and regulations. Topics include sources, forms, and methods used to assess and manage energy use in buildings, water use and management, materials, consumable management, consumption, waste management, and workplace site management. Students will apply concepts needed to successfully organize, monitor, communicate and develop a good sustainability program. ***Pre-requisite: CM-375 and FM-301*** (3-0-3)

FM-450 Principles of Real Estate

Real estate concepts related to facilities are examined. Topics include real estate strategies, assessment for acquisition and disposal, asset management, asset life, space management, and new construction. ***Pre-requisite: FM-301***

FM-460 Facilities Risk Management and Communication

The responsibility for emergency preparedness, facility resilience and business continuity is central to the role of facility managers. Topics covered are risk management planning, risk management, risk assessment, emergency preparedness with response and recovery, facility resilience, business continuity, resilience, planning communication, delivery communication, and evaluation communication. ***Pre-requisite: FM-301***

FM-457 Internship in Facilities Management

Successful completion of an approved internship is a graduation requirement. The internship program complements classroom learning by exposing students to various facilities management functions on real-life projects. ***Prerequisite: sophomore status.***

FM-458 Senior Design Project

Student proposes, designs, writes and presents a project manual for a successful facilities manager managing a large facility that would be considered critical in the event that it was not operating properly. ***Prerequisite: senior status.***

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)

INT-501 Intelligence, International Security, Counterterrorism, and Homeland Security Integration

This course provides an introduction to the study of intelligence and international security by training students in intelligence analysis to enable them to write briefing and analytic products that are used in the analysis of international security, counterterrorism, and homeland security studies. Such an integrated analytic approach is required because of the integrated nature of international security, counterterrorism, and homeland security. The analytic methodologies taught will draw on the concepts of risk-based security management approaches. Students will also explore the national strategies and programs developed by the United States and its allies to deal with on-going threats at the international, national and local levels, including how to balance the need for security and maintenance of civil liberties. Students will apply the course's analytic intelligence methodologies to examine selected case studies. Prerequisite: None. (3)

HP-252 Critical Issues in 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)

HP-255 History of the African Diaspora

This course investigates the history and effects of the post-1450 diaspora of Africans around the globe with attention given to the interactions of African-Americans. Of particular interest is how social, economic, and political institutions, geographical factors, technology, and other cultural forces influenced and were influenced by African contributions to the modern world at large. ***Prerequisite: EN-101.*** (3-0-3)

HU-121 Arabic I

This course focuses on speaking, reading, writing, and comprehension of Modern Standard Arabic. The course develops Arabic reading and writing skills. The course introduces all 28 letters of the alphabet plus the 112 variations. Students learn Arabic grammar and vocabulary usage. Students learn the morphology of verbs and their grammatical constructions. There will be significant practice in pronunciation, conversations, listening comprehension, sentence structures, and writing during class. ***Prerequisite: None*** (3-0-3)

HU-131 Chinese I

The course will cover an introduction to the Mandarin Chinese language, basic grammar, Pinyin system, vocabulary, usage, and the Chinese writing system. It will also develop an understanding of modern China and knowledge of the Chinese culture. There will be significant practice in pronunciation, conversations, listening comprehension, sentence structures, and writing during class. ***Prerequisite: None.*** (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-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. ***Prerequisite: 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-215 Professional Communications

This course examines the theory and practice of multiple communication channels encountered in today's professional environment. Topics include presentations, groups and specialized writing formats. ***Prerequisite: EN-102.*** (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 workflow 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 Multi-Cultural Literature

This course surveys literature from a variety of cultures, both here in US and around the world. Authors and works covered vary by semester. ***Prerequisite: EN-101.*** (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 socio-political systems and to recognize various ways of viewing reality. ***Prerequisite: EN-102.*** (3-0-3)

HU-332 Arts & 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. ***Prerequisite: EN-102***. (3-0-3)

HU-371 Film Appreciation

The course introduces the narrative and stylistic techniques used in film making to better understand how meaning is constructed, conveyed, and interpreted in film. In a participatory lecture format and by viewing a wide variety of films, the student will critically explore thought- provoking works and the creative approaches behind each one to develop an informed perspective. Other key aspects of film making including film genres, film criticism, and mythic structures are explored. ***Prerequisite: EN-102.*** (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 academic dean. ***Prerequisite: EN-101.*** (3-0-3)

HU-402 Classical Mythology

Students will examine gods, goddesses, and heroes of ancient Greece and Rome. A comparison of myths from Greece and Rome with myths from other cultures will be studied. Myths and other stories will be analyzed based on their relation to nature, history, politics, and psychology. Students will apply myth interpretations to stories in contemporary media. ***Prerequisite: EN-102.*** (3-0-3)

HU-403 Engineering Poetry

In this course, poetry is explored through readings by engineers, mathematicians, and others in STEM fields. Students will see how poetry expanded the technologists' creative thought in both professional and personal ways. Students will hone their ability to read and understand poetry, as well as have the chance to write some of their own. ***Prerequisite: EN-102 or permission of instructor.*** (3-0-3)

HU-404 Science & Science Fiction-19th Century

This course examines the transformative nature of 19th century literature from a scientific perspective. Students will see how the industrial, scientific and cultural changes wrought by the Industrial Revolution and the rapid pace of scientific breakthroughs of the century influenced the creative nature of literature at the time and their effects today. Period short stories, novels and publications will be analyzed and discussed. Individual and group written and oral assignments are required. ***Prerequisite: EN-102 or permission of the instructor.*** (3-0-3)

IAE-201 Introduction to IA 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. Classes are a mixture of lecture, current event discussions, and laboratory exercises. ***Prerequisites: MA-110 or MA-112.*** (3-0-3)

IAE-250 Computer & 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. ***Prerequisite: IAE-201.*** (3-0-3) *FORMERLY IAE-301

IAE-260 Secure System Admin & Ops - UNIX

This course is an overview of securing the UNIX operating system. The content will include a basic Introduction of: shell programming, process management, and 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 interface (CLI) and a basic programming language. ***Prerequisites: IAE-201, CS-150, and CT-152. *FORMERLY IAE-315*** (3-0-3)

IAE-261 Secure Sys Admin & Operations - Windows

This course is an overview of securing the Windows operating system. The content will include a basic Introduction of: shell programming, process management, and 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 Windows command line interface and a basic programming language. Basic knowledge of C programming, scripting and Windows is helpful but not required. ***Prerequisites: IAE-201, CS-150 and CT-152.*** (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 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-260.*** (2-2-3)

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. This course prepares students for the AccessData Mobile Phone Examiner Plus (MPE+) Certification. Prerequisite: IAE 250 and 311.*** (3-0-3) Lab Fee Required.

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. This course prepares students for the Certified Wireless Security Professional (CWSP) Certification. ***Prerequisites: IAE-250 and CT-240.*** (3-0-3)

IAE-325 Secure Data Communications & Cryptography

This course follows the protocol education provided in IAE-250 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-250 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, IAE-325.*** (3-0-3)

IAE-351 Introduction to Cyberspace 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-250.*** (3-0-3)

IAE-372 Mathematics of 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-250, MA-114.*** (3-0-3)

IAE-390 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. This course prepares students for the EC Council Certified Ethical Hacker (CEH) certification. ***Prerequisites: CT-240 and IAE-260. Recommended corequisite: IAE-402.*** (3-0-3) *FORMERLY IAE-410

IAE-400 Special Topics in IA

Research into information assurance subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and academic dean. 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-260.*** (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. This course prepares students for the AccessData Certified Examiner (ACE) and Mobile Phone Examiner Plus (MPE+) Certifications. Lab fee required. ***Prerequisites: IAE-260 and 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-430 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 plants). Until recently, these systems were connected to company networks by privately owned Information Technology (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 United States Government partnering with private industry. Students will be challenged with hands-on lab exercises focused on protecting these critical systems. (3) ***Prerequisite by permission of the instructor.***

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-250.*** (3-0-3)

IAE-457 Senior Design Project I

Students/teams select a project, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements (constraints) and engineering, software, and/or security specifications, propose solutions and multiple designs, analyze proposed designs, and select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper systems engineering and project management to their work. Additional components may be required in some projects. Students/teams submit a final report at the end of the semester. ***Prerequisite: Senior standing.*** (3-0-3)

IAE-458 Senior Design Project II

Students/teams build and test their selected designs (completed in 457). Each student team delivers a tested prototype and defends its project in front of a panel of experts. Students/ teams submit a final report that includes description of the design, realization, and test processes as well as test results, discussion, and conclusion. Failure to deliver a completed design and a working prototype that meets engineering, software, and/or security specifications by the end of the semester may result in failing the course. *Note: Course must be completed with a grade of C or higher to meet undergraduate graduation requirements. ***Prerequisite: IAE- 457.*** (3-0-3)

IAE-470 Controlled Unclassified Information (CUI)

The Controlled Unclassified Information (CUI), the program is the protection of sensitive federal information while residing in nonfederal systems and organizations is of paramount importance to federal agencies and can directly impact the ability of the federal government to carry out its designated missions and business operations. The guiding document outlines 14 requirement families for the CUI program. The guidance applies to the use of the security controls contained in various National Institute of Standards and Technology (NIST) controls and the Department of Defense Cybersecurity Maturity Model Certification (CMMC) Domains. Students will learn the elements of the requisite publications and guidance as they apply to implementation by the federal government, state, local authorities, and private industry. The course will provide the skills and tools to achieve results for CUI effectively. Relevant Federal regulation, policies, guidance, and cover in-depth the risk management framework. Students will be challenged with hands-on exercises as an introduction to the risk assessor specialty. Prerequisite Course(s): Permission of the Instructor (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-490 Design & Mgmt of Operations Centers

Modern organizations operate in a very dynamic and fast moving environment which requires collaboration with personnel both internally and externally via state of the art communications systems and technologies. Operations Centers (OC) can be chartered for daily operations as well as response to specific crisis or situations. This course will address the design and operation of an OC to include Mission, Network, Intelligence and Security missions. This course is designed to address how such OCs are chartered; designed; built, operated, and maintained. This course can be taught in multi-disciplinary or departmental approach. The course is built upon a virtualized infrastructure which provides a look at the systems, databases, applications, personnel, and procedures required to perform the assigned mission. Tours of local OCs will be scheduled and students will conclude the course with a capstone exercise which they will plan and execute. MOC/NOC/SOC. ***Prerequisite: IAE-201 and permission from department head.*** (3)

IAE-500 Introduction to Information Assurance

This course will provide the requisite computer, data communications, Internet and database skills to students embarking on careers in information assurance, 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 Cybersecurity degree program, and the several certificate programs offered in various IA concentrations. Labs, simulations and special problems will be used throughout the course.

Courses

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 IA

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

IAE-605 Masters 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 a 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. Students in this course will conduct a final exercise penetration testing networks created in the IAE- 680 course. This course prepares students for the EC Council Certified Ethical Hacker (CEH) certification. ***Prerequisite:***

IAE 685 and CS-620 or waiver. (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. 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. Students will learn how to perform the forensic examination of mobile devices using both commercial and open source tools. Students will describe and analyze effects of mobile device malware on forensic examinations Students in this course will learn how to properly identify, preserve, analyze, examine data and report on mobile device data. ***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. This course prepares students for the Certified Wireless Security Professional (CWSP) Certification. Case studies will be used throughout the course. Students are required to purchase an Alfa wireless adapter and acquire a wireless router. ***Prerequisite: IAE-675.*** (3)

IAE-630 SCADA Networks & 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 Access & 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. ***Prerequisite: IAE 685.*** (3)

IAE-651 Introduction to Cyberspace 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: None.*** (3)

IAE-652 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. (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 & 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. (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. Students are expected to have knowledge of Calculus I and a scripting language such as python. ***Prerequisite: IAE 685 and CS-620 or permission of department chair.*** (3)

IAE-673 Secure Info Transfer & 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. (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. (3)

IAE-675 Computer Forensics & 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. This course prepares students for industry recognized forensic certifications. ***Prerequisite: IAE-685 and CS-620 or waiver.*** (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. ***Prerequisite CS-620 or waiver. Co- requisite: IAE-675.*** (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. ***Prerequisite CS-620 or waiver. 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 credit 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 operating systems, 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 (CISSP)

Complementary Security is best defined as taking holistic, defense-in-depth approach to designing a complete Information Security Program. In the course, students will learn how individual domains of security from the (ISC)2 CISSP Common Book of Knowledge work together to properly address cyber risks within an organization. At the end of the course, students will be able to: (a) utilize industry best practices and frameworks to design a complete and customizable Information Security Program for any organization; (b) understand how to manage the program from an executive (CISO) level; (c) and have the knowledge necessary to take the CISSP exam. ***Prerequisite: IAE-685.*** (3)

IAE-685 Principles of Cyber 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. (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. ***Prerequisites: IAE 685. IAE 682 recommended.*** (3)

IAE-690 Healthcare Info 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 Masters Capstone

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. Students may petition for a job related substitute course. (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 Info. 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-802.*** (3)

IAE-835 IA 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 IA

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-865 Special Topics in HR 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 IA

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 IA

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 IA

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 IA

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 IA

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)

IAH-301 Honors Comp Computer & Network Security

Building on IAE-201, this course provides NSF Cyber Transfer Student Program (CTSP) scholars with detailed and hands-on knowledge of computer and network security. 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. CTSP Scholars are expected to conduct a focused research project and presentation at the end of the course. Classes are a mixture of lecture, current event discussions, and laboratory exercise review and will prepare learners for the CompTIA Security+ certification. This course is taught each fall semester for each new cohort of NSF CTSP scholars. ***Prerequisite: IAE-201.*** (3-0-3) NOTE: Same course as IAE-250

IE-701 Principles of Designing 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 testbook, 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 will help students understand the design and architecture of networks and network services that enable the delivery of business-grade cloud services. Students will understand how virtualized data-center infrastructure lays the groundwork for cloud-based services, automated self-service portals, how to classify cloud services and deployment models, and understand the actors in the cloud ecosystem. Students will review the elements, requirements, challenges, and opportunities associated with network services in the cloud, optimize data centers via network segmentation, virtualization-aware networks, virtual network services, and service overlays, and systematically secure cloud services. Students will learn about the crucial role of organizations such as Federal Risk and Authorization Management Program (FedRAMP), National Institute of Standards and Technology (NIST), Cloud Security Alliance (CSA), and the International Standards Organization (ISO) in creating standards. Students will be challenged with cutting edge hands on labs from leading cloud vendors and a major cloud project. Students will also learn about containerization and micro services. This course is appropriate for Computer Science, Engineering and Cyber Security majors. Also crosslisted as CS-412/71 3. ***Prerequisite: instructor 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 of Intellect 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 Management Math 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: placement test score.*** (3-0-3)

MA-111 Business Management Math 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-261. 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 placement test score.*** (3-0-3)

MA-114 Algebra and Trigonometry

Designed for students needing mathematical skills and concepts for MA-261; 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 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 placement test score.*** (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, MA-111 or MA-112.*** (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. ***Prerequisites: 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***. (4-0-4)

MA-262 Calculus II

Courses

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.*** (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 MA-230.*** (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-330 Linear Algebra

This course introduces the study of linear systems of equations, vector spaces, and linear transformations. Students will solve systems of linear equations as a basic tool in many mathematical procedures used in science and engineering. Topics include solving linear equations, performing matrix algebra, calculating determinants, finding eigenvalues and eigenvectors and developing an understanding of a matrix as a linear transformations relative to a basis of a vector space. ***Prerequisite: MA-262.*** (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 for 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, CS-150 or CS-130.*** (2-2-4)

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)

MA-524 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. (3)

MA-525 Statistics Using Excel

This course provides an understanding of basic statistical principles and tests and their application using Excel. Topics include collecting and organizing data, theorems, descriptive and inferential statistics, probability, discrete and normal distributions, sampling distributions, central limit theorem, estimation and hypothesis testing and regression analysis. ***Prerequisite: undergraduate statistics course or work experience.*** (3)

MAF-800 Manufacturing Research Background

The student will focus on the study of Manufacturing process and developments over the previous decades. The course will assist the student in synthesizing how demand and technology have led to the current systems and procedures. The student will explore current operations within a global context as well as areas improvement for the future. The focus will be to start identifying areas for research at a later stage and explore the background. (6)

MAF-810 Manufacturing Research Methodologies

The student will evaluate and develop research methodologies and strategies suitable for Manufacturing and address the data sources and information to test a hypothesis or research question. It is expected the student will be building upon MAF 800 in refining and developing their research task and plan. ***Prerequisite: MAF-800.*** (6)

MAF-820 Manufacturing Future Demands

The student will research the future demands on a regional, national and global level and how these influence the specific research questions and demands. Data collection and applications will be central to evaluating the needs of Manufacturing on the short, medium and long term. ***Prerequisite: MAF-810.*** (6)

MAF-830 Strategies for Manufacturing

The student will undertake a robust and comprehensive analysis of the strategies for preparation, protection, and resilience of Manufacturing. Students will be introduced to the influences of economics and politics that dictate manufacturing planning based upon non-technical aspects and requirements (e.g., how noise pollution dictates design and efficiency as well as operations). ***Prerequisite: MAF-810.*** (6)

MAF-840 Manufacturing Research Proposal

The student will produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and a timing plan. The doctoral student will then complete the research milestones according to the proposal and research plan. ***Prerequisite: MAF-830.*** (6)

MAF-900 Manufacturing Doctoral Writing I

The student will compose and complete Chapters 1 and 2 within the boundaries of the proposal and research plan. Chapters 1-2 will be reviewed by the student's Chairand Committee and must be approved for the student to advance. ***Prerequisite: MAF-840.*** (6)

MAF-910 Manufacturing Doctoral Writing II

The student will compose and complete Chapter 3 within the according to the approved proposal. The student will also submit Chapters 1-3 to the Institutional Review Board (IRB) and Academic Review Board (ARB). After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. ***Prerequisite: MAF-900.*** (6)

MAF-920 Manufacturing Doctoral Writing III

The student will compose and complete Chapter 4. The student will provide a complete and substantive presentation of the research results in Chapter 4. The student's Chair and Committee must review and approve Chapter 4 for the student to advance. ***Prerequisite: MAF- 910.*** (6)

MAF-930 Manufacturing Doctoral Writing IV

The student will compose and complete Chapter 5 and submit the work to the student's Chair and Committee. The student will also finalize all required elements of their research. The student's Chair and Committee must review and approve the complete document. The student's Chair and Committee will then submit the complete document to the University Reviewers and PhD Review Board for approval. The student must receive approval from the University Reviewers and Ph.D. Review Board to advance forward. ***Prerequisite: MAF-920.*** (6)

MAF-940 Manufacturing Doctoral Defense

Upon approval from the University Reviewers and PhD Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through viva voce (i.e., oral examination). The student's Chair, Committee, and Ph.D. Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. ***Prerequisite: MAF-930.*** (6)

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-510 Analytics and Decision Analysis

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. ***Recommended prerequisite: Undergraduate statistics or SM-525.*** (3)

MBA-515 Applied Statistics and Visualization for Analytics

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 software for analysis. A final project will involve visualization of a real data set. ***Prerequisite: MBA-510.*** (3)

MBA-520 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: MBA-510.*** (3)

MBA-540 Web Analytics

The course covers concepts and techniques for retrieving, exploring, visualizing, and analyzing social network and social media data, website usage, and clickstream data. Students learn to use key metrics to assess goals and return on investment, perform social network analysis to identify important social actors, subgroups, and network properties in social media. Students will learn specialized skills in Advanced Excel, Python, JavaScript (D 3.js, Leaflet.js), HTML/CSS, API Interactions, Social Media Mining, SQL, Tableau, Advanced Statistics, Machine Learning, R, Git/GitHub, and more. ***Prerequisite: MBA-510.*** (3)

MBA-600 Fundamentals of Prof 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 Admin

Research into business administration subjects. Student primarily works in a guided study format with a mentor. Permission required from the instructor and academic dean. 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. if taking MBA 620, it is preferable to complete it before MBA 615. ***Prerequisite: MBA 600 or undergraduate degree in business.*** (3)

MBA-616 Financial & Contract Management

This course is an Introduction to financial and contract management for technical managers. Topics include financial management accounting (including elementary accounting principles, assets, liabilities, and stockholders? equity), direct and indirect costs, revenues, profits, indices to financial position, use of financial reports, return on investment, net present value, internal rate of return, and financial management (including cash and funds flow statements). An Introduction to the principles of contract formation is presented, highlighting the distinctive characteristics of contracting with the federal government as well as the team concept for effective contracting. The role of the program manager as the key team members is a prime focus. Subcontract management, competitive negotiation techniques, contract financing, and cost reimbursement are also included. Case studies supplement theoretical discussions. (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 Org Behavior in Tech Environment

Technology has created amazing new opportunities for businesses and organizations. Mobile smartphones, tablets, all-in-one desktops and sophisticated software are just some of the radical changes that have revolutionized the workplace. Although the explosive technology growth has increased productivity and advancement, it has also created changes in worker requirements, employee expectations and workplace changes. This course analyzes organizational behavior in a technical environment. Cases are analyzed to develop skills in applying theories to common managerial problems in technology driven organizations. Students completing this course may not enroll in SM-51 3 for additional credit. (3)

MBA-627 Impact of Emerging Tech on Management

This course will focus on emerging technologies that influence management. Students will learn leading edge skills to understand the technologies and innovations that are increasingly changing the business and public administration landscape. The course will put students at the forefront of new technology to produce value for their future business, employers, and customers. (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-631 Technical Personnel Management

This course reviews the problems of personnel management in a technical organization. Topics include environmental requirements for effective and innovative technical efforts, direction and motivation, leadership behavior, recruitment of technical staff, orientation and training programs, personnel placement and reassignment, assignment of work, salary administration, personnel evaluation and counseling, professional growth and promotion, technical obsolescence and retraining, equal opportunity programs, employee grievances, and handling of conflict situations. Students explore typical personnel management situations that arise in a technical organization. (3)

MBA-635 Technology-Enabled Operations

This course will prepare you to contribute effectively in today's technology-enabled workplace by understanding how to leverage processes, systems, and data to create business value. We'll examine business operations in traditional companies, between firms, and in digital businesses. We will consider the perspectives and needs of both start-ups and established organizations. (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. (3)

MBA-646 Federal Contract 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. Project management is examined in the realm of various technology fields. (3)

MBA-647 Methods of Project Management

Methods of 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 Mgmt/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 & 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 & Ethical

As the comprehensive business law course, areas of law critical to the success of technology managers and entrepreneurs are examined. Topics include contract issues, torts and product liability, business crimes, intellectual property, cyber law, cybercrimes, the law and structure of business organizations, employment, and bankruptcy. The legal issues are also exploredin the context of a rapidly evolving global cyber environment, changing technology and business practices. (3)

MBA-659 Leadership & 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 academic dean. This course may be repeated with different projects to a maximum of 9 credits. (3)

MBA-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-672 Mathematics of 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. Students are expected to have knowledge of Calculus I and a scripting language such as python. ***Prerequisite: IAE 685***

and CS-620 or permission of Department Chair. (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 & 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)

MBA-705 Org Chg & Info Sys Implementation

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)

MEC-155 Introduction to Materials Science

Origin and behavior of materials. Classifications of materials. Physical metallurgy mechanical and physical properties, crystalline structure, imperfections in solids, phase diagrams, failure mechanisms in materials, hardening and tempering, isothermal diagrams. Involves hands-on experiences through lab sessions in the use of metallurgical and mechanical testing equipment. Lecture and laboratory. (3-0-3)

MEC-210 Engineering Mechanics - Statics

Fundamental concepts and conditions of static equilibrium; their application to systems of forces and couples acting on rigid bodies; and the calculation of centers of gravity, centroids, and moments of inertia. ***Prerequisites: MA-261. Corequisite: PH-261.*** (3-0-3)

MEC-215 Introduction to Engineering Design CAD

Introduction to computer-aided design (CAD) for product design, modeling, and prototyping. Individual use and team-based environment to design and prototype a functional and manufacturable marketable product. Application to design, manufacturing, and analysis using geometric tolerancing and dimensioning. Two hours lecture and three hours laboratory. (2-3-3)

MEC-220 Principles of Mechatronics

This course will introduce you to Mechatronics as a multidisciplinary engineering discipline that includes electronics, electrical, mechanical, computer systems engineering, together with information technology. Theory lectures will introduce the core components of mechatronic systems: electrical and electronic components and circuits, sensors and actuators. In laboratory work, you will work on putting theory into practice in the context of a challenging project that is at the core of a national design and build competition. This course significantly develops the generic skills of teamwork, planning, leadership, and communication. Conventional lectures will be given on the theoretical aspects of these graduate capabilities. You will then apply these skills in the completion of specific learning activities such as design project, report, testing and prototyping. The dry run testing of the prototype Mechatronics mechanisms will provide an opportunity for you to receive feedback. ***Prerequisites: EL-150 and MEC-215.*** (3-0-3)

MEC-310 Engineering Mechanics - Dynamics

Kinematics of particles in rectilinear and curvilinear motions. Kinetics of particles, Newton's second law, energy and momentum methods. Systems of particles, Kinematics and plane motion of rigid bodies, forces and accelerations, energy and momentum methods. Introduction to mechanical vibrations. ***Prerequisites: MEC-210 and MA-262.*** (3-0-3)

MEC-330 Fluid Mechanics

Continuum, velocity field, fluid statics, manometers, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flow in channels and around submerged bodies, one-dimensional gas dynamics, turbo- machinery. Applications in hydraulic, pneumatic, and fluidics discussed. Two hours lecture and three hours laboratory. ***Prerequisites: MEC-310 and MA-262.***

MEC-370 Electronics and Instrumentation

Introduces use and analysis of electronic circuits and input mechanism of various sensors, design of analog signal conditioning systems based on the system requirement, as well as understanding the theory and the art of modern instrumentation and measurements (I&M) systems. Topics include BJT and MOSFET circuit model and analysis; operational amplifier; instrumentation amplifier; survey of sensor input mechanisms; analog signal conditioning and sensor application; measurement system architecture; errors in measurement; standard used in measurement. Two hours lecture and three hours laboratory. ***Prerequisite: EL-200.*** (2-3-3)

MEC-375 Engineering Safety

Safety and health in the manufacturing, construction, and utilities industries, including pertinent laws, codes, regulations, standards, and product liability considerations. Organizational and administrative principles and practices for safety management and safety engineering, accident investigation, safety education, and safety enforcement. (3-0-3)

MEC-410 Kinematics & Dynamics of Machinery

The kinematics and dynamics of machinery and its applications to mechatronic systems. Analysis of motion translation/rotation in machinery, energy of machine mechanisms. Involves projects, seminars, and workshops regarding graphical, analytical, and numerical techniques for dynamic analysis and synthesis of machines. Two hours lecture and three hours laboratory. ***Prerequisite: MEC-310.*** (2-3-3)

MEC-455 Mechatronic System Design

Presents specifics in the mechanical design of mechatronic systems. Includes problem analysis, conceptualization, design/material selection, and performance analysis. Addresses mechanical subsystems, bill of materials, and economic analysis of the system. Two hours lecture and three hours laboratory. ***Prerequisites: MEC-330 and MEC-410.*** (2-3-3)

MEC-462 Automation Systems Design

Capstone design project. Design and analysis of a complete mechatronic system using controllers, sensors, and actuators. Advance systems programming with current industrial network programs and GUIs. Implementation of project and process management principles as well as professional documentation and presentation. Two hours lecture and three hours laboratory. ***Prerequisites: EE-285 and MEC-455.*** (2-3-3)

MIL 800 - Military Leadership Research Background

The student will focus on the study of the latest military leadership strategies, tactics, and developments. The student will synthesize the growing effect of current military leadership practices on military operations, national military-civilian relationships, and international relationships. The student will identify military leadership failures and areas for improvement. The faculty will directly suppo11 and mentor the exploration phase of the planning. (6)

MIL 810 - Military Leadership Research Methodologies

Under a Chair and committee, a student will continue evaluating the military leadership field. The student will also develop research methodologies and strategies suitable for understanding military leadership. The student will address the data sources, information, and intelligence to test a hypothesis or research question(s). The student will build upon MIL-800 in refining and developing their research task and plan. (6)

MIL 820 – Military Leadership Future Demands

Under a Chair/Committee, the student will further research military leadership's future demands and explore specific research questions. Data collection and applications will be central to evaluating military leaders' needs in the shm1, medium, and long term. The literature review will be more specific in focus and direction at this stage. (6)

MIL 830 - Military Leadership

Under the Chair/Committee's direction, the student will undertake a robust and comprehensive analysis of the strategies for the growth and evolution of military leadership. The student's topic will gain a definitive direction. The student will develop a draft methodology. The student's Chair/Committee will review both to ensure the topic's scope is not too broad and the draft methodology is appropriate. (6)

MIL 840 - Military Leadership Research Proposal

The student will produce a research proposal that is comprehensive in detail and planning. The research proposal will address the research topic, general problem, specific problem, purpose, research questions, limitations, delimitations, and timing plan. The doctoral student will then complete the research milestones according to the proposal and research plan. The student must gain IRB and ARB approvals by this stage. (6)

MIL 900 - Military Leadership Doctoral Writing I

The student will compose and complete Chapters I and 2 within the proposal's boundaries and research plan. The student will use the materials developed during the 800 series courses. The student's Chair/Committee will review Chapters 1-2. The Chair/Committee's approval is required for the student to advance. The Dean of Doctoral Programs will review any disagreements raised by the student's Chair/Committee.

MIL 910 – Military Leadership Doctoral Writing II

The student will compose and complete Chapter 3 (the methodology chapter that is robust and identifies all implications) according to the approved proposal. After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. (6)

MIL 920 - Military Leadership Doctoral Writing III

The student will compose and complete Chapter 4. The student will provide a complete and substantive presentation of the research results in Chapter 4. The student's Chair/ Committee must review and approve Chapter 4 for the student to advance. (6)

MIL 930 – Military Leadership Doctoral Writing IV

The student will compose and complete Chapter 5 and submit the work to the student's Chair/Committee. Students will also finalize all required elements of their research. The student's Chair/Committee must review and approve the complete document. The student's Chair/Committee will then submit the complete document to the University Reviewers and Ph.D. Review Board for approval. The student must receive approval from the University Reviewers and Ph.D. Review Board to advance. (6)

MIL 940 – Military Leadership Doctoral Defense

Upon approval from the University Reviewers and Ph.D. Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through viva \'ace (i.e., oral examination). The student's Chair, Committee, and Ph.D. Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. (6)

NT-100 Computer Architecture & 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 CISCO's ICND1. (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 Permissio***n. (4)

NT-350 Virtualized Networks and Data Center

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)

OP-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. Students completing this course may not enroll in PH-261 for additional credit.*** (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.*** (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. Students completing this course may not enroll in PH-201 for additional credit.*** (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.*** (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 and PH-262, or permission of instructor. (3-0-3)***

PHL-813 Professional Ethics & Leadership

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)

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-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)

PRM-500 Becoming the Successful Product Manager

This course focuses on the role of the successful product manager. Students will examine market research techniques and tools, ideation, planning, forecasting, production, and marketing of a product at all stages of the product lifecycle. The course will delve into analyzing market conditions, defining the features and functions of a product, and supervising the production of the product. The course will explore new product development and delivery methodologies as well as the related impact on product success and customer satisfaction. Students will learn how to use focus groups, customer site visits, ethnography, consumer panels, social media, crowdsourcing, Alpha and Beta testing, and market testing as tools effectively. Students analyze how the product manager creates superior and differentiated new products—ones that deliver unique benefits and great value to the customer while producing product profitability for the company. ***Prerequisite: None. (3 Credits)***

PRM-510 Winning Product Management Strategies, Roadmaps and Business Cases

This course emphasizes innovation strategies, particularly the framework and direction for product development. Students will examine the benefits and limitations of specific innovation strategic frameworks as well as the role of supporting strategies of technology, marketing, platforms, intellectual property, and capability. The student will explore how product roadmaps are created and updated as ideas are refined. The student will also develop a business case, examine ways of winning buy-in from the people whose support is essential to success, and develop a product charter. ***Prerequisite: PRM-500. (3 Credits)***

PRM-520 New Products Process

The success of new products is highly dependent on the quality of a company's product development practices and processes. This course explores how structured and consistent processes across an organization contribute significantly to the successful development of products. The Stage-Gate, Integrated Product Development (IPD), Waterfall, Agile, Lean, and Design Thinking product development models all have advantages in specific situations. Students will learn the principles of each model and how to apply one or more of those models to particular circumstances. Students will also gain advanced knowledge of the software development process (e.g., Agile, Scrum, Jira, Git, DevOps, QA, etc.) and the UX design process and tools (e.g., User Research, Prototyping, Usability Testing, INvision, Balsamiq. etc.) to work effectively with developers, UX designers, and data scientists/analysts. ***Prerequisite: PRM-500. (3 Credits)***

PRM-530 Product Management Tools and Metrics (3 Credits)

The course examines a wide range of tools at all levels of product development, including new product process, product design, product portfolio management, and product life cycle management. Students will translate knowledge into measurable and manageable actions and tasks. Students will also learn to employ performance metrics, emphasizing the application of metrics for learning and continuous improvement. Prerequisite: PRM-500.

PRM-540 Leveraging Expert Systems, Big Data, and Business Analytics for Product Management (3 Credits)

This course focuses on Expert Systems, Big Data, and Business Analytics within the context of product management. The student's knowledge base will expand through an exploration of the role of Expert Systems in product development and lifecycle management. The student will also demonstrate how the Product Manager can apply Big Data and Business Analytics to help improve product competitiveness and find new opportunities. ***Prerequisite: PM-500.***

PRM-600 Designing and Developing Great Products (3 Credits)

Students will design a new product in this course. The student will develop prototypes of increasing precision. The student will evaluate design feedback from customers and continue improving their product. During the process, students will also analyze a range of development issues and best practices, including the use of sprints, establishment of appropriate infrastructure, progress tracking, and working with remote and third-party teams. ***Prerequisite: PRM-500***.

PRM-610 Managing the Life of a Product (3 Credits)

This course will prepare the student for a product launch through close coordination with key departments like marketing, operations, sales, and quality assurance. The student will build up to an effective product launch, and then learn how to track and manage the product in the market after launch. The student will focus on collaboration to ensure appropriate growth in product features as well as market viability. Finally, the student will analyze the decisions and steps needed when "sunsetting" a product at the end of its life cycle. ***Prerequisite: PM-500.***

PRM-625 Product Management Culture, Organizations, and Teams (3 Credits)

Product Management success depends on the people, culture, and environment of a company that is created to foster innovation. Technology has created new opportunities for product management businesses and organizations. This course focuses on the characteristics of an innovative culture, requirements for a high performing team, structures to support cross-functional teams, and different project contexts. Students will also explore the roles and responsibilities at various levels and within different stages of product development. Cases will be analyzed to examine common product management problems in technology-driven organizations. ***Prerequisite: PM-500.***

PRM-635 Technology-Enabled Product Management Operations (3 Credits)

This course will prepare you to contribute effectively to today's technology-enabled product management workplace by understanding how to leverage processes, systems, and data to create business value. Students will examine product management operations in traditional companies, between firms, and in digital businesses. Students will analyze the perspectives and needs of both start-ups and established product management organizations. ***Prerequisite: PM-500.***

PRM-700 Product Management Capstone (3 Credits)

The Product Management Capstone is the culminating effort of the student's entire learning experience. The student will prepare for and take the Product Development and Management Association's New Product Development Professional (NPDP) Certification exam to demonstrate mastery of the PDMA Body of Knowledge and the Program Outcomes. The student will also complete a master's level thesis research project (with the submission of a final report, approval by a thesis committee, and an oral defense of the research work) or a comprehensive Product Management project. Students will choose either the thesis research or product management project option. The Capstone Course must be taken at the end of the student's degree program. ***Prerequisites: All PRM degree program courses prior to PRM-700.***

PRM-800 Product Management Research Background

The student will focus on the study of the latest Product Management processes and developments. The student will synthesize the growing effect of technology on current operations, internationalrelationships and effects on the field, and where there are areas of improvements or failings. The focus will be to start identifying areas for research at a later stage and explore the background. (6)

PRM-810 Product Management Research Methodologies

The student will evaluate and develop research methodologies and strategies suitable for Product Management and address the data sources and information to test a hypothesis or research question. It is expected the student will be building upon PRM-800 in refining and developing their research task and plan. ***Prerequisite: PRM-800***. (6)

PRM-820 Product Management Future Demands

The student will research the future demands Product Management and how these influence specific research questions. Data collection and applications will be central to evaluating the needs of Product Management on the short, medium and long term.

Prerequisite: PRM-810. (6)

PRM-830 Strategies for Product Management

The student will undertake a robust and comprehensive analysis of the strategies for the growth and evolution of Product Management. Students will analyze the influences of economics, international politics, and sustainability that dictate planning based upon non- technical aspects. For example, how international disputes effect key resources, costs, and schedules. ***Prerequisite: PRM-810***. (6)

PRM-840 Product Management Research Proposal

The student will produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and a timing plan. The doctoral student will then complete the research milestones according to the proposal and research plan. ***Prerequisite: PRM-830***. (6)

PRM-900 Product Management Doctoral Writing I

The student will compose and complete Chapters 1 and 2 within the boundaries of the proposal and research plan. Chapters 1-2 will be reviewed by the student's Chair and Committee and must be approved for the student to advance. ***Prerequisite: PRM-840.*** (6)

PRM-910 Product Management Doctoral Writing II

The student will compose and complete Chapter 3 within the according to the approved proposal. The student will also submit Chapters 1-3 to the Institutional Review Board (IRB) and AcademicReview Board (ARB). After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. ***Prerequisite: PRM-900.*** (6)

PRM-920 Product Management Doctoral Writing III

The student will compose and complete Chapter 4. The student will provide a complete and substantive presentation of the research results in Chapter 4. The student's Chair and Committee must review and approve Chapter 4 for the student to advance. ***Prerequisite: PRM- 910.*** (6)

PRM-930 Product Management Doctoral Writing IV

The student will compose and complete Chapter 5 and submit the work to the student's Chair and Committee. The student will also finalize all required elements of their research. The student's Chair and Committee must review and approve the complete document. The student's Chair and Committee will then submit the complete document to the University Reviewers and Ph.D. Review Board for approval. The student must receive approval from the University Reviewers and Ph.D. Review Board to advance forward. ***Prerequisite: PRM-920.*** (6)

PRM-940 Product Management Doctoral Defense

Upon approval from the University Reviewers and Ph.D. Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through viva voce (i.e., oral examination). The student's Chair, Committee and Ph.D. Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. ***Prerequisite: PRM-930.*** (6)

ROB-100 Introduction to Robotics

This Introductory course is a hands-on Introduction to the key concepts and tools underpinning robotic systems in use and development today. Intended to give students the tools to understand robotic systems, to explore robotics for their own purposes, and to pursue advanced study in the field. The course will cover the fundamentals of manipulators, sensors, actuators, end effectors and product design for automation, kinematics, control, programming of manipulators, along with an Introduction to pattern recognition and computer vision. (3-0-3)

ROB-200 Robotics Systems Engineering & Analysis

This course examines methods of specifying, designing, analyzing and testing robotics systems. The principles and processes of robotics systems engineering are introduced and applied to the development of robotic devices. The focus is on a robotic system engineered to perform complex behavior. Robotic systems embed computing elements, integrate sensors and actuators, operate in a reliable and robust fashion, and demand rigorous engineering from conception through production. The course is organized as a progression through the systems engineering process of conceptualization, specification, design, and prototyping with consideration of verification and validation. Students completing this course will engineer a robotic system through its compete design and initial prototype. ***Prerequisites: ROB-100, EL-100 and EL-150*** (3-0-3)

ROB-300 Industrial Robotics

This course will cover the principles and techniques involved in industrial robotics. Emphasis will be placed on industrial robot applications, analysis of robot manipulators, components of industrial robots, robot programming and control. Students will explore the use of robotics and machine learning in the efficiency of industrial processes. Students will model, design, plan, program, select, and implement industrial robot systems. ***Prerequisites: ROB-200, EE-210, EE- 220, and EL-215.*** (3-0-3)

ROB-382 Robotic Systems

An Introduction to the design and control of autonomous robots. Mechanical considerations and detection and navigational ability. Students will develop algorithms and use machine learning techniques to generate programs to control electromechanical systems to perform tasks. The class incorporates team-based projects and laboratories. ***Prerequisites: EL-262, ROB- 300.*** (3-0-3)

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 Prof. Research Theory & 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. (3)

RSC-811 Prof. Research Theory & 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.***

RSC-812 Prof Research Theory & 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.*** (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 Prob. Solve 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 Situation Awareness Analysis & Action

Students will generate a purpose statement, problem statement, and research question within their selected dissertation topic area. ***Corequisite: RSC-810.*** (3)RESIDENCY

RSC-821 Contemporary Research in Management

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) RESIDENCY

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)

RSC-826 Applied Research in Management & Decision Sciences

This course is a continuation of RSC 811 and RSC 821. It is devoted to enhancing student understanding of dissertation research practices, with the intent of completing an initial draft of Chapter 1 of the doctoral dissertation. ***Prerequisite: RSC-811 and RSC-821.*** (3)

RSC-860 Research Design

This course will expose the student to the overall research design process through the analysis of knowledge claims, strategies of inquiry, and the development phases of the research project. We will examine how to consider the philosophical worldviews and how they are applied to the quantitative, qualitative, and mixed methods research methodologies. In addition, this course will provide the student with a brief Introduction to questionnaire design.

RSC-899 Doctoral Dissertation Research

This course allows those students who have completed all relevant coursework in their Doctoral program to maintain continuous enrollment in good standing. This course does not apply toward degree requirements and may not be used to establish full or part time status for financial aid. Course may be repeated as needed. ***Prerequisite: Permission of Dean***. (1)

SAF-100 Construction Safety Regulations

This course examines the Occupational Safety and Health Administration (OSHA) 29 CFR 1926 regulations, policies and procedures for the construction industry. Consideration is given to work tasks and practices in the construction industry that account for the most fatalities and injuries. The groundwork for creating safety and health programs that comply with OSHA and other regulatory standards and best practices as they build a compliance model for occupational health and safety programs in construction will be laid. (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-120 EM 385 and DOD Construction

This course covers the health and safety requirements for U.S. Army Corps of Engineers (USACE) activities and operations that apply to contractors, military and government employees who are tasked with enforcing or complying with the EM 385-1-1 USACE Safety and Health requirements on Department of Defense (DOD) sites. Compatibilities, comparisons and contrasts between the EM 385-1-1 manual requirements and OSHA general industry and construction standards is an essential part of this course. ***Prerequisite: SAF-100.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-214 Hazardous Materials

This course will examine the hazards related to using, transporting, storing, disposing of hazardous materials. Elements of hazard communication, such as the Globally Harmonized System and transportation safety (placarding/manifesting), spill prevention and response, hazardous waste disposal, material substitution and sustainable alternatives, and storage (UST/ AST) containment, permitting and design will be covered. ***Prerequisite: MA-114, MA-128, and PH-201.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-216 Fire Prevention and Protection

This course covers the foundational principles of fire prevention and protection. Topics covered in this course include: chemical, electrical, natural, structural, and mechanical explosion hazards; fundamentals of fire science; fire detection; fire suppression; hazardous materials segregation/separation; and, housekeeping. Written safety and emergency action plans, procedures, work practices and elements of site and facility design will be covered as they relate to fire prevention and protection. ***Prerequisite: MA-114, MA-128, and PH-201.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-300 Industrial Hygiene I

Industrial Hygiene I provides an Introduction to industrial hygiene and occupational/ environmental health concepts. This course introduces students to environmental risk, epidemiology, toxicology, policy, and regulation. Industrial hygiene concepts and calculations related to corrosives, flammables, toxic materials (particulates, liquids, gases and vapors), and related chemical reactions are covered. Biological and chemical hazards are the primary occupational health topics covered in this course. Application of the industrial hygiene principles of anticipation, recognition, evaluation and control to the unique exposure scenarios in construction are highlighted. ***Prerequisite: MA-114, MA-128, and PH-201.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-302 Industrial Hygiene II

Industrial Hygiene II reinforces the foundational industrial hygiene concepts discussed in Industrial Hygiene I. A continuation of the examination of chemical hazards and the Introduction of the many physical hazards that fall under the occupational health discipline are covered. Industrial hygiene concepts and calculations related to electricity, radiation, ventilation, noise, climate conditions, illumination, vibration, noise, and fall protection are covered. Application of the industrial hygiene principles of anticipation, recognition, evaluation and control to the unique exposure scenarios in construction are highlighted. ***Prerequisite: SAF-300.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-304 Ergonomics

This course covers basic ergonomic and human factors concepts, such as anatomy, kinesiology, physiology, biomechanics, anthropometry, and physical/psychosocial ergonomic risk factors. Mechanisms of injury for common musculoskeletal disorders (MSDs), preventative measures, compensation, rehabilitation and return to work strategies will be discussed. Common tools and strategies used to recognize and analyze work tasks for ergonomic risks and the evaluation of common work environments, including the mechanics of recommending and supporting ergonomic improvements, use of ergonomic innovations, and task/work environment redesign will be examined. ***Prerequisite: MA-114 and PH-201.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-316 Safety Management Systems

This course examines the concepts and principles involved in organizing and managing safety performance within an organization. The integration of company-wide safety programs/ policies/procedures, safety performance metrics, and the importance of management support. Key elements of a safety management system and the associated systems, processes and procedures used in achieving high safety standards in organization are discussed with an emphasis on the importance of critical thinking with regard to the implementation of safety management systems in the construction industry. ANSI Z10 and ISO 45001 will be used as the framework for these discussions. ***Prerequisite: SAF-120.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-318 Training and Adult Education

This course covers adult learning theory and techniques, data collection, needs analysis and feedback, behavior and performance modification, presentation tools, competency assessment, conflict resolution, mentoring, negotiation strategy, multidisciplinary teamwork, methods of facilitating teams, and strategies for interpersonal communications. This course will explore the role of construction safety professional's role in maintaining workplace safety competencies and outcomes as they relate to safety education required for employee onboarding, regulatory compliance, competent person requirements, and refresher training. (3-0-3)

*Course offered in 8-week asynchronous online format.

SAF-400 Environmental Permitting & Management

Environmental permitting (NPDES, air, solid waste, etc.) required by federal, state and local regulatory agencies, emergency action planning, disaster preparedness, and environmental hazards awareness topics (hazardous waste, chemical spills, soil and groundwater pollution, site remediation) are discussed in this course. Engineering and administrative controls, required training (HAZWOPER), signs, written plans, work practices (decontamination), and environmental management systems standards are covered and environmental principles related to sustainable construction, building and development are examined. ***Prerequisite: SAF-214.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-402 Construction Safety Management

This course will examine the use of financial principles, statistics, and performance metrics and indicators as they apply to influencing project management and safety outcomes in a construction setting. Management processes related to emergency, crisis, disaster planning and business continuity with be explored and the role of construction safety in the evaluation of cost, schedule, performance and risk will be discussed. Specific programs requiring special consideration and training, such as cranes, materials handling, confined spaces, fall protection, hazard communication, control of hazardous energy, excavation/trenching/shoring, workplace violence and physical security are covered. ***Prerequisite: SAF-120.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-414 Construction Risk Management

This course will examine risk management as a key component of a successful construction safety program. Hazard identification, risk analysis, risk evaluation, risk treatment, risk communication and risk monitoring and review concepts and tools will be discussed as they relate to the development and implementation of effective hazard prevention and mitigation during facility renovations, small- and large-scale construction projects, and management of general industry contractors. Prevention through Design (PtD) is and sustainability in building practices and materials are highlighted in this course. ***Prerequisite: SAF-316 and SAF-402.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-416 Current Issues in Construction Safety

This course will cover current issues in the construction industry that present unique safety concerns for construction sites and personnel. Emphasis will be placed on understanding current and emergent work exposure issues, such as silica, lead, asbestos and nanotechnology. In addition, topics such as work site automation, robotics, workplace violence, substance abuse, wellness programs and new regulations will be discussed. ***Prerequisite: SAF-120.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-455 Construction Safety Senior Project

The student proposes, designs, completes and construction industry safety-based capstone project. Students write a report according to specifications. ***Prerequisite: SAF-414 and CM-250.*** (3-0-3) *Course offered in 8-week asynchronous online format.

SAF-800 Occupational Health & Safety Implications

The student will focus on the studying the latest occupational health and safety implications of the rapid infusion of new technology in the workplace. The student will synthesize the growing effect of technology on safety, worker health, and potential liabilities. The student will start identifying areas for extensive research and exploration. (6)

SAF-810 New Hazards to OHS

The student will research the new material and robotic hazards proliferating in the workplace. The student will build upon SAF-800 by refining and further developing their research topic. ***Prerequisite: SAF-800.*** (6)

SAF-820 Advanced Research Methods for OHS

The Chair will guide the doctoral student through advanced research methods for Occupational Health and Safety. The student will incorporate these skills in their plan for doctoral research. ***Prerequisite: SAF-810.*** (6)

SAF-830 Comprehensive Strategies for OHS

The student will thoroughly analyze comprehensive strategies for the Occupational Health and Safety field. The student will synthesize the full range of strengths, weaknesses, and gaps in the existing comprehensive strategies in the workplace. The student will incorporate the findings in to their research plan. ***Prerequisite: SAF-820.*** (6)

SAF-840 Occupational Health & Safety Proposal

The student will produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives, milestones, and a timing plan. After the doctoral student's Chair approves the proposal, the student will then begin work according to the proposal and research plan. ***Prerequisite: SAF-830.*** (6)

SAF-900 OHS Doctoral Writing I

The student will compose and complete Chapters 1 and 2 within the boundaries of the proposal and research plan. Chapters 1-2 will be reviewed by the student's Chair and

Committee and must be approved for the student to advance. ***Prerequisite: SAF-850.*** (6)

SAF-910 OHS Doctoral Writing II

The student will compose and complete Chapter 3 within the according to the approved proposal. The student will also submit Chapters 1-3 to the Institutional Review Board (IRB) and Academic Review Board (ARB). After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. ***Prerequisite: SAF-900.*** (6)

SAF-920 OHS Doctoral Writing III

The student will compose and complete Chapter 4. The student will provide a complete and substantive presentation of the research results in Chapter 4. The student's Chair and Committee must review and approve Chapter 4 for the student to advance. ***Prerequisite: SAF- 910***. (6)

SAF-930 OHS Doctoral Writing IV

The student will compose and complete Chapter 5 and submit the work to the student's Chair and Committee. The student will also finalize all required elements of their research. The student's Chair and Committee must review and approve the complete document. The student's Chair and Committee will then submit the complete document to the University Reviewers and Ph.D. Review Board for approval. The student must receive approval from the University Reviewers and Ph.D. Review Board to advance forward. ***Prerequisite: SAF-920.*** (6)

SAF-940 OHS Doctoral Defense

Upon approval from the University Reviewers and Ph.D. Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend the same through viva voce (i.e., oral examination). The student's Chair, Committee, and Ph.D. Review Board will confer to determine if the student has provided a sufficient and necessary final oral defense of the research. ***Prerequisite: SAF-930.*** (6)

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. 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: CS-225 or CS-230 or CS-200.*** (2-2-3)

SE-457 Senior Design Project I

Students/teams select a project, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements (constraints) and engineering, software, and/or security specifications, propose solutions and multiple designs, analyze proposed designs, and select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper systems engineering and project management to their work. Additional components may be required in some projects. Students/teams submit a final report at the end of the semester. ***Prerequisite: Senior standing***. (3-0-3)

SE-458 Senior Design Project II

Students/teams build and test their selected designs (completed in 457). Each student team delivers a tested prototype and defends its project in front of a panel of experts. Students/ teams submit a final report that includes description of the design, realization, and test processes as well as test results, discussion, and conclusion. Failure to deliver a completed design and a working prototype that meets engineering, software, and/or security specifications by the end of the semester may result in failing the course. *Note: Course must be completed with a grade of C or higher to meet undergraduate graduation requirements. ***Prerequisite: SE-457.*** (3-0-3)

SP-100 Internship Course

This is an elective course intended to provide students with an alternate educational experience in academia, industry or government that complements and strengthens their classroom education. Prerequisites: Approval of appropriate Dean required. (1-0-1)

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 of appropriate dean 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 of appropriate dean required. (3-0-3)

SP-400 Spec: Topic in Business & 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 academic dean. 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. ***Prerequisite or Corequisite: EN-101.*** (3-0-3)

SS-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)

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-280 Culture Through Literature

This is a survey course that is designed to give students an overview of diversity in literature and its effect on social trend and culture traditions during the 20th century and beyond. Students will read and research literature from minority U.S. authors and how their writings affected both their respective minority communities as well as the effect their writing had on culture & society as a whole. Students will be required to read assigned books, make an oral presentation and conduct research dealing with a diverse author and their literature. (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 academic dean. (3-0-3)

SUS-700 Fundamentals of Graduate Research & Design

Project I will introduce the fundamentals of graduate research and design. The project will focus on graduate level writing, APA style, and the fundamentals of scientific inquiry. The project will cover the areas of technology research, ethics of research, the stages of the research process, conceptualization and operationalization of research questions, data collection techniques, analytics, an Introduction to qualitative and quantitative methods and measurement, a discussion of program evaluation research, and research proposal development. Prerequisite – None.

SUS-710 Ethics and Philosophy of Research and Data Collection

It will address the ethics of conducting scholarly research. The discussion of research ethics will include, but not be limited to, informed consent, protecting anonymity of participants, and ethical participant protocols. Discussions will address the limits of researchers' obligations, along with providing a detailed look at the process of applying for Institutional Review Board approval. This project will provide students with an overview of the range of data collection methods available to individuals undertaking research and to enable the student to consider the implications, application strengths and weaknesses of the various data collection methods. The module will also provide insight into the ways that such methods may be applied effectively and ethically in research.

SUS-715 Sustainability for Future Demands

Under a Chair, a student will further research the future demands in the Sustainability field and how these influence specific research questions. Data collection and applications will be central to evaluating the needs of sustainability in the wider context on the short, medium and long term to tackle environmental concerns. The literature review will be more specific and extensive in focus and direction at this stage. The ARB will be completed at this stage

SUS- 725 Sustainability Research Proposal

The student will develop a research methodology based on the literature, needs and research problem. A formal application for IRB approval is needed that is comprehensive in detail and planning. The student will then complete the research data collection necessary to start the analysis stage.

SUS- 735 Sustainability Project & Defense

The student will analyze the data collected and produce the analysis, conclusions and recommendations. The Thesis will be written, reviewed and approved prior to the defense of the work. The Chair and committee will be at the defense and upon satisfactory presentation and defense a grade will be awarded accordingly.

TC-110 Introduction to Telecommunications

Students will learn to define telecommunications and its effects on our daily lives, structure of the telecommunications industry, brief history, basic terminology, types of analog and digital communications systems, data communications and networking. This course is an intro to local area networks, and wide area networks, microwave and cellular systems, satellite systems, the 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 & 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 Telecom

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 Adv. 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)

TC-458 Senior Design Project in Telecommunications

Technical analysis of a telecommunications system, operational analysis of on-site facilities. Students produce a technical document suitable for publishing. Students may elect to take EE-458 in place of TC-458, but must inform the EE-458 instructor and do a communications-oriented project.

TEC-700 Project 1: Fundamentals of Graduate Research & Design

Project I will introduce the fundamentals of graduate research and design. The project will focus on graduate level writing, APA style, and the fundamentals of scientific inquiry. The project will cover the areas of technology research, ethics of research, the stages of the research process, conceptualization and operationalization of research questions, data collection techniques, analytics, an Introduction to qualitative and quantitative methods and measurement, a discussion of program evaluation research, and research proposal development. (6)

TEC-710 Project 2: Ethics & Philosophy of Research & Discussion

Project II will address the ethics of conducting scholarly research. The discussion of research ethics will include, but not be limited to, informed consent, protecting anonymity of participants, and ethical participant protocols. Discussions will address the limits of researchers' obligations, along with providing a detailed look at the process of applying for Institutional Review Board approval. This project will provide students with an overview of the range of data collection methods available to individuals undertaking research and to enable the student to consider the implications, application strengths and weaknesses of the various data collection methods. The module will also provide insight into the ways that such methods may be applied effectively and ethically in research. (6)

TEC-720 Project 3: Qualitative & Quantitative Research Design

Project III introduces the main research designs used in qualitative research. In addition to covering conceptual and epistemological issues associated with qualitative research design, the course introduces a range of qualitative research techniques. The strengths and limitations of various qualitative designs are explored with emphasis on issues of reliability, validity and representativeness. This project also introduces the main research designs used in quantitative research. In addition to covering conceptual and epistemological issues associated with quantitative research, the course introduces a range of techniques used in quantitative research. The strengths and limitations of various quantitative designs are explored with emphasis on issues of reliability, validity and representativeness. ***Prerequisite: TECH 700 and TECH 710.*** (6)

TEC-730 Project 4: Applied Statistics, Analytics, Decision Analysis & Visualization

Project IV covers the basic concepts of probability, common distributions, statistical methods, data analysis, developing a critical approach to the analysis of contingency tables, examining the basic ideas and methods of generalized linear models, linking logit and log-linear methods with generalized linear models, and developing basic facility in the analysis of discrete data using SAS, R, and Python. The project will also cover operations research techniques and their application to decision making such as mathematical optimization, networks modeling, stochastic modeling, and multi-objective modeling. Other topics covered include computer simulation, decision analysis using decision trees, and quantitative value functions. The project will culminate with visualization techniques. Students will learn different means of combating information overload as well as visual encoding as a method to supplant cognitive calculations with simpler perceptual inferences, improve comprehension, memory, and decision making. ***Prerequisite: TECH 700 and TECH 710.*** (6)

TEC-740 Project V: Capstone Project

Project V is the Capstone project. This project provides an opportunity for students to undertake an extensive piece of academic writing based on an original research conducted by the student. The research will be supervised by a faculty member and must be defended through oral examination. The thesis is a medium to demonstrate the student's understanding of research methods as applied to a topic of the student's selection. Students may also use this class to begin the prospectus for doctoral studies. ***Prerequisite: TECH 700, TECH 710, TECH 720, and TECH 730***. (6)

TEC-800 Writing the Doctoral Proposal I

Project I. The student and the student's Committee will work to produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and a timing plan. Further, the skill set of the student will be evaluated by the committee and recommendations may be made to the PhD Review Board to address deficiencies. (6)

TEC-810 Writing the Doctoral Proposal II

Project II. The student will work to complete research milestones related to chapter one of their research according to the proposal and research plan. The prospective chapter will be reviewed by the student's Committee for approval prior to advancing to the next phase in the program. ***Prerequisite: TEC-800.*** (6)

TEC-820 Writing the Doctoral Proposal III

Project III. The student will undertake a robust and comprehensive literature review, equivalent in scope and aim to a dissertation chapter two, within the boundaries of the proposal and research plan. The prospective chapter will be reviewed by the student's Committee for approval prior to advancing to the next phase in the program. ***Prerequisite: TEC-810.*** (6)

TEC-830 Writing the Doctoral Proposal IV

Project IV. Students will complete the research milestones associated with chapter three of the research. Further, students will finalize Institutional Review Board and Academic Review Board documentation. All research materials will be reviewed by the student's Committee and, upon reaching approval consensus, the committee will notify the PhD Review Board of the student advancing to proposal oral defense status. ***Prerequisite: TEC-820.*** (6)

TEC-840 Doctoral Proposal Oral Defense

Project V. Upon approval from the Institutional Review Board, Academic Review Board, and PhD Review Board, the student will prepare a presentation for oral defense of the research proposal, research plan, and initial chapters of the dissertation. The PhD Review Board and Dissertation Committee will evaluate both the student's proposal oral defense as well as the student's potential to complete the next phases of original research. ***Prerequisite: TEC-830.*** (6)

TEC-900 Doctoral Research Preparation I

Project VI. After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. A complete and substantive presentation of the research results will be produced, equivalent to a dissertation chapter four. The student's Committee will review and approve related research materials. ***Prerequisite: TEC- 840.*** (6)

TEC-910 Doctoral Research Preparation II

Project VII. The student will compose a draft research document in the appropriate form consisting of five chapters and submit the draft to the student's Committee. The student's Committee will review and approve related research materials. The student will make any required changes. ***Prerequisite: TEC-900***. (6)

TEC-920 Doctoral Research Preparation III

Project VIII. The student will finalize the research document consisting of five chapters. The student's Committee will submit chapters four and five to university reviewers for approval. During Project VIII, the student is required to make the recommended changes and re-submit to the student's Committee; the student's Committee will re-submit to the university reviewers for final approval. ***Prerequisite: TEC-910.*** (6)

TEC-930 Doctoral Research Preparation IV

Project IX. The student will finalize the research document consisting of five chapters and will submit the document to the student's Committee. Upon review and approval, the student's Committee will notify the PhD Review Board of the student's readiness for oral defense. The student will be responsible for preparing the oral defense and submitting for approval. ***Prerequisite: TEC-920.*** (6)

TEC-950 Doctoral Presentation and Oral Defense

Project X. Upon approval from the PhD Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend such through oral examination. The student's committee and PhD Review Board will confer to determine if the student has provided a sufficient and necessary oral defense of the research. ***Prerequisite: TEC-930.*** (6)

UAS-101 Introduction to Unmanned & Autonomous Systems

This course presents an Introduction to Unmanned and Autonomous Systems operations. This includes a historical perspective and background information of this system including its: modeling and control fundamentals, ground based systems, visual and electro-optical aspects of navigation, obstacle and terrain avoidance systems, modular on-board processing systems, and current applications. This course also exposes students to the significant regulations impacting unmanned systems operations. (3-0-3)

UAS-102 Mechanics of Unmanned & Autonomous Systems

This course will provide the student an understanding of the component systems common to most Unmanned and Autonomous Systems with an emphasis on effective integration and operations. The course focuses on the core technologies and includes examinations of the control systems, power plants (motors), servos/actuators, power sources, and communication technologies utilized in unmanned systems. (3-0-3)

UAS-110 Air Traffic Control Communications

This course presents an overview of the history of air traffic control, air traffic control tower procedures, radar systems, radar separation, radio communications and techniques, flight plan clearances, traffic management and emergency procedures and priority handling survey. ***Prerequisite: UAS-101, UAS-102.*** (3-0-3)

UAS-120 UAS Operator Certification

The course will develop the student's knowledge and skills that are needed to safely exercise the privileges and responsibilities of a Remote Aircraft Pilot. Course content includes instruction in aerodynamics, aircraft systems, FAA regulations, U.S. Airspace System, weight and balance, aircraft performance, aviation weather, flight publications, radio navigation, cross-country planning and navigation, basic flight physiology, and flight safety. This course will develop the student's knowledge and skill needed to manage and operate small unmanned aircraft systems. Flight activities will include launch and recovery operations, emergency procedures, plus mission planning and execution. Students must complete the appropriate flight lessons to satisfactorily complete the course. ***Prerequisite: None.***

UAS-130 UAS Safety Management Systems

This course presents an overview of related unmanned and autonomous safety topics, including current safety issues, the role of federal agencies, accident statistics, causes of accidents, human factors, crew resource management skills, and accident prevention. ***Prerequisite: UAS-101 and UAS-102.*** (3-0-3)

UAS-140 UAS Operations

This course provides an overview of the principles used in the design and operation of unmanned and autonomous systems (UAS) to support applications in air, ground, water, and space environments. The platform, sensors, power plant, control, and communications systems that are required in unmanned and autonomous systems will be explored with respect to function and interaction. The student will conduct a detailed examination of the components of unmanned systems and the critical parts played in operations. Topics include component capabilities, limitations, selection, overall system design concepts, criticality to system function, and applications in the civilian, commercial, and military fields. (3-0-3)

UAS-150 UAS Crew Planning

This course is an Introduction to the concepts and principles of crew resource management (CRM) in unmanned systems. Topics include human performance in crews, communication, decision making, situational awareness, workload management, team building, and human- machine interaction. The relationships of CRM principles will be explored in air, land, and water type vehicles. Additionally, contrasts of manned and unmanned systems and the essential coordination of unmanned and autonomous systems teams will be explored in-depth. ***Prerequisite: UAS-140.*** (3-0-3)

UAS-201 UAS Sensors

This course covers payload systems capable of being installed on air (UAV), ground (UGV), and water-based vehicles (UMV). The student will gain an understanding of various sensory payloads and appropriate applications that may be used on multiple platform types. The student will learn to select sensors depending upon mission requirements, platform capabilities, data types, and environmental impacts. An Introduction will be made to tools for data analysis after capture and storage. ***Prerequisite: UAS-101, UAS-102.*** (3-0-3)

UAS-202 UAS Ground Vehicles

This course provides the principles and concepts of unmanned and autonomous vehicles used for ground applications. Students will explore the problems of perception, navigation, communications, control, sensors and payloads, and fundamentals of locomotion in the environments found on the land. The capabilities and limitations will be examined and the student will be able to select the appropriate platform types and sensors to meet application requirements. Current trends such as driverless cars, autonomous buses and trains, and agricultural vehicles will be highlighted with the most successful systems and their technologies. ***Prerequisite: UAS-140. (***3-0-3)

UAS-210 UAS Design

This course provides the principles and concepts essential to the design and operation of unmanned and autonomous systems (UAS) and their subsystems. Communications, components, and networking are explored as the infrastructure to ensure system and subsystem interoperability. Students will examine technologies dealing with facets of mobile computing platforms, machine-learning, network protocols and communication systems to support intra-system and inter-system coordination. Topics include system requirements, constraints, dependability, regulations, communications, cybersecurity, avionics and sensors. ***Prerequisite: UAS-140.*** (3-0-3)

UAS-220 Introduction to Processing Rem Sensed Data

Students are introduced to basic theory, history, and practical applications of remote sensing technology, with an emphasis on high spatial resolution multispectral aerial imagery collected using unmanned aircraft systems. Other topics include geographic information systems, aerial image interpretation, sensor resolution, orthomosaics, georegistration, vegetation indices, and image classification. ***Prerequisite: UAS-201.*** (3-0-3)

UAS-230 Unmanned Surface & Underwater Vehicle

This course provides the principles and concepts of unmanned and autonomous vehicles used for water applications where unique challenges for mobile robotic systems are encountered. Students will explore the problems of perception, navigation,

Courses

communications, control, sensory payloads, and fundamentals of propulsion in the water environment. The capabilities and limitations will be examined and the student will be able to select the appropriate platform types and sensors to meet application requirements. Applications explored include both surface and underwater functions in the civilian, commercial and military fields. ***Prerequisite: UAS-140.*** (3-0-3)

UAS-240 Unmanned Space Vehicles

This course provides the principles and concepts of unmanned and autonomous vehicles used for space applications. The challenges of space as an environment, navigation, time, and distance will be included as essential elements of overall space exploration via unmanned and autonomous systems. Students will explore the problems of perception, space navigation, communications, control, sensors and payloads, time delay, and fundamentals of propulsion and motion in space. Capabilities and limitations of multiple platform types will be examined and the student will be able to select the appropriate platform types and payloads to meet mission and application requirements. Applications explored include earth orbital, interplanetary, solar system, and planetary/celestial body exploration. ***Prerequisite: UAS-150, UAS-220.*** (3-0-3)

UAS-250 Unmanned Vehicle Environments

This course presents the challenges to unmanned and autonomous systems (UAS) encountered in their operational capacities. The student is exposed to the aspects of extreme environments where the vehicles and communications must operate in all conditions. The presence of adverse factors and disturbances could disrupt the function of the communications and controllers and lead to significant degradation of performance, causing instability and possible damages. Students learn to match platform capabilities, communications abilities, and payloads with the mission requirements to meet the demands of a variety of environments. The students develop an understanding of extreme or uncertain environments, the limitations inflicted on UAS systems, and possible methods to overcome them. ***Prerequisite: UAS-140.*** (3- 0-3)

UAS-310 Unmanned Vehicle Missions

This course exposes the student to the concepts and principles of mission planning for leaders, operators, communicators, and data analysts involved in unmanned and autonomous systems (UAS). The student will gain an understanding of the processes in the missions of UAS including planning, execution, acquisition, processing, analysis, and dissemination. This course also addresses the suitability of unmanned technologies to support common missions such as law enforcement, hazardous materials detection, natural disaster assessment, border patrol, agriculture survey, search and rescue, crop improvement, transportation inspections, utility inspections, weather observation, monitoring of renewable energy sources, and others. Prerequisite: ***UAS-101, UAS-102*** (3-0-3)

UAS-320 Unmanned Vehicle Business Decisions

This course provides students an overview of the business aspects of unmanned and autonomous systems (UAS) and methods of making better informed decisions. Students will explore multiple commercial business problems, define requirements, and design solutions based on system capabilities, business need, costs, productivity, regulatory restrictions, safety, and risk. Business cases will be reviewed for aerial, ground, and water UAS. ***Prerequisite: UAS- 120, UAS-310.*** (3-0-3)

UAS-330 Unmanned Systems Crew Resource Management

Principles of organizational behavior, interpersonal relationship skills, and critical behavioral dynamics used by Unmanned Aircraft Systems (UAS) crews. Information processing, Human Error, Communications Processes, Problem Solving, Workload Management, and Situational Awareness with particular attention given to dealing with teleoperation and automation in UAS application. (3-0-3)

UAS-410 Unmanned Vehicle Laws & Regulations

This course introduces students to laws and regulations related to unmanned and autonomous systems (UAS) operations. The issues of local, state, federal, and international laws and agreements are presented with regard to aerial, ground, water, and space environments. Aspects of vehicle operation, sensor operation, ethics, dominion, jurisdiction, privacy, and security will be highlighted. ***Prerequisite: UAS-320.*** (3-0-3)

UAS-420 Data Acquisition & Post-processing

Students build upon the basic image processing skills gained in the previous course, expanding their knowledge of common aerial image data processing tasks using industry-standard software packages. Aerial data collection methodologies are introduced, including consideration of aerial mission flight parameters. ***Prerequisite: UAS-220.*** (3-0-3)

UAS-430 UAS Data Visualization & Present

This course combines the science of data visualization for Unmanned and Autonomous Systems (UAS) with the art of graphic design to help you communicate complex information more accurately and effectively. By transforming UAS data sets into visual graphics—such as charts, bar graphs, scatterplots, and, heatmaps—you can make complex ideas more easily accessible and understandable. Through hands-on exercises, students will explore the many types of data in use today, learn how people perceive different graphical displays, and create visual presentations that make a stronger impact on your audience. Students will learn how to translate simple and complex data into effective visual displays, communicate more precisely by pinpointing the most relevant information, and apply effective methods for analyzing, presenting, and using statistical data. Students will also learn to identify the strengths and weaknesses of different data visualization approaches and avoid creating misleading representations of data, and being misled by others. ***Prerequisite: UAS-420.*** (3-0-3)

UAS-457 Senior Design Project I

Students/teams select a project, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements (constraints) and engineering, software, and/or security specifications, propose solutions and multiple designs, analyze proposed designs, and select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper systems engineering and project management to their work. Additional components may be required in some projects. Students/teams submit a final report at the end of the semester. ***Prerequisite: Senior standing.*** (3-0-3)

UAS-458 Senior Design Project II

Students/teams build and test their selected designs (completed in 457). Each student team delivers a tested prototype and defends its project in front of a panel of experts. Students/ teams submit a final report that includes description of the design, realization, and test processes as well as test results, discussion, and conclusion. Failure to deliver a completed design and a working prototype that meets engineering, software, and/or security specifications by the end of the semester may result in failing the course. *Note: Course must be completed with a grade of C or higher to meet undergraduate graduation requirements. ***Prerequisite: UAS- 457.*** (3-0-3)

UAS-500 UAS Operator Certification

The course will develop the student's knowledge and skills that are needed to safely exercise the privileges and responsibilities of a Remote Operations Pilot. This course will develop the student's knowledge and skill needed to operate small unmanned aircraft systems and take the FAA UAS initial aeronautical knowledge exam. Course content includes Federal Aviation Regulations, airspace authorization criteria, and operational approval requirements. Operational skills will be acquired through both classroom and hands-on flight activities. Students must complete the appropriate UAS flight lessons to satisfactorily to complete the course.

UAS-501 Unmanned Vehicle Theory & Practice

This course provides an overview of unmanned and autonomous systems (UAS) and their subsystems as critical elements in their application to civilian, commercial, and military fields. The students will explore case studies in aerial, ground, water and space environments and examine mission requirements, selection standards, limiting factors, and regulatory issues. Emphasis is on the total system including reliability, maintainability, system support, and total system performance toward fulfillment of user needs and results in the operational environment. (3)

UAS-502 Unmanned & Autonomous Vehicle Systems

This course provides an overview of theory and practice of unmanned and autonomous vehicle systems, including hardware, software, command, control, and communication (C 3) structures of mobile robotic systems development. Topics include an overview of platforms (including land, air, marine, and space platforms), actuators and motion control, sensors and perception (including GPS, inertial, magnetic, active ranging, computer vision, photo detectors, and encoders), planning and navigation (including reactive, deliberative, and hybrid approaches to autonomy). Case studies, readings from current literature, and guest lectures present best practices in the field. The course includes a microprocessor-based project. (3)

UAS-510 Unmanned Systems Autonomy & Automation

This course provides students with an opportunity to examine the benefits, limitations, and capabilities of autonomous control technology and support for unmanned systems. The student will examine and evaluate elements, components, technology, and processing methods associated with autonomous and semi-autonomous operation of unmanned systems. The content of the course includes supported capabilities, reference framework, man-machine collaboration, cognitive capability, interaction and manipulation, allocation of functions and responsibilities, high-level trade-offs, limitations, and associated advancements. This course prepares students to better understand the implications and capabilities associated with autonomy in unmanned systems. It will include examinations of associated technology, programming, processing, and interoperability required to understand the application of autonomy and automation. ***Prerequisite: UAS-502.*** (3)

UAS-520 Unmanned Vehicles Sensors and Data

This course provides the student with an understanding of the complexities of sensory operations and data processing in unmanned and autonomous systems (UAS). The student will examine multiple sensory devices including their capabilities, acquisition rates, and constraints as factors of device selection. The issues of data acquisition, formats, storage, processing, and communications within the vehicle, the system, and between multiple systems will be explored. ***Prerequisite: UAS-502.*** (3)

UAS-530 User Interface for Design & Evaluation

This course introduces user interfaces for unmanned and autonomous systems through designing, implementing, and evaluating human-computer interfaces of various types. It focuses on the emerging field of human-robot interaction (HRI) which comprises a multitude of disciplines including: robotics, artificial intelligence, human factors, human computer interaction and cognitive psychology. Topics include: Approaches to human-system interactions for unmanned systems including graphical user interfaces, non-visual feedback (haptic, aural, etc.), gesture-based controls, voice-based controls, telepresence, interaction and architectures, programming languages, metrics, social robotics, emotions, frameworks and relations between perception, actuation and HRI. Includes hands-on experience with one or multiple user interface technologies. The theoretical foundation for designing interfaces is complemented by practical classroom exercises and the design and development of a prototype in a team-based setting using previously learned principles. ***Prerequisite: UAS-502.*** (3)

UAS-640 Data Analysis & Visualization

This course is an Introduction to key design principles and techniques for interactively visualizing data. Includes the review, design, planning, analysis and statistical interpretation of data to support unmanned and autonomous applications. The major goals of this course are to understand how visual representations can help in the analysis and understanding of complex data, how to design effective visualizations, and how to create interactive visualizations using modern web-based frameworks. Students will build on statistical theory and learn advanced techniques that can be applied to problem solving, research analysis and numerical interpretation of data. In addition, students will learn basic visualization design and evaluation principles, and learn how to acquire, parse, and analyze large datasets. Students will also learn techniques for visualizing multivariate, temporal, text-based, geospatial, hierarchical, and network/graph-based data. Additionally, students will utilize software tools to prototype many of these techniques on existing datasets. Students must have some previous statistics course or experience. ***Prerequisite: UAS-520.*** (3)

UAS-650 UAS Laws, Regulations and Policy

This course will survey the rapidly evolving field of the law and public policy governing the use of autonomous systems of all types of Unmanned Aircraft Systems (UAS) in the national airspace (NAS). The course will proceed based on six modules addressing various aspects of the new field of UAS and autonomous vehicle Law. These modules are: (1) Emerging FAA Regulatory Framework; (2) Government Use of UAS, autonomous systems, and the Fourth Amendment; (3) State Regulation of Government and Commercial autonomous systems; (4) Tort Liability for autonomous and UAS Operations; (5) Emerging Frameworks for autonomous systems and Privacy; and (6) Overview of Intellectual Property Issues for the unmanned and autonomous industry. Upon successful completion of the course, the student will have a working knowledge of the legal issues relevant to the autonomous vehicle and UAS industry. (3)

UAS-660 Safety Management Systems & UAS Cybersecurity

Overview of related unmanned and autonomous safety topics, including current safety issues, role of federal agencies, accident statistics, causes of accidents, human factors, crew resource management skills, and accident prevention. Course discusses the safety requirements, hazard and risk analysis, failure modes and effect analysis, fault tolerance, basics of hardware and software reliability, levels of integrity, nature of faults and redundancy, and issues of verification, validation and certification. Cybersecurity issues pertinent to computer- based infrastructure, mobile robotics, and the information-driven nature of unmanned and autonomous ventures. Topics include threats, assumptions, assurance, confidentiality, integrity, availability, access control matrix and policies, security models, requirements imposed by policies, protection models, covert channels, formal methods for security, intrusion detection, auditing, and other issues associated with dynamic and vehicular systems. ***Prerequisite: UAS- 502.*** (3)

UAS-670 UAS Management for Managers

This course provides the student an understanding of planning, scheduling, and managing unmanned and autonomous projects. Course includes roles, responsibilities, administrative procedures, cost control, documentation, quality control, and applications. This course introduces concepts of leadership, organizational and technical management which are approached from a complex systems perspective to explain the behavior of autonomous and semi-autonomous systems. This course addresses the fundamental principles of system management and explores issues related to effective technical planning, scheduling and assessment of technical progress, and identifying the unique challenges of the technical aspects of autonomous systems and the ability to control them. Topics will include techniques for life cycle cost, performance measurement, modern methods of effective project management, quality management, risk management, functional analysis, and communications. ***Prerequisite: UAS-650.*** (3)

UAS-710 UAS Capstone Project I

The Capstone Project is the culminating effort of the student's entire learning experience. The student will complete a comprehensive exam that provides significant evidence of experience in unmanned and autonomous systems studies master's level thesis and research project (with submission of a final report, approval by a thesis committee, and an oral defense of the research work), or a project resulting in fabrication of a prototype and publication of refereed article. Students will work with designated faculty to formulate, develop, and complete the project, thesis, or exam. The completion of the Capstone Course is designed to document significant evidence that all Program Outcomes have been met and provides the student evidence of experience to show to current and prospective employers. The Capstone Course must be taken at the end of the student's degree program. ***Pre- or Corequisite: UAS-710.*** (3)

UAS-720 UAS Capstone Project II

The Capstone Project is the culminating effort of the student's entire learning experience. The student will complete a comprehensive exam that provides significant evidence of experience in unmanned and autonomous systems studies master's level thesis and research project (with submission of a final report, approval by a thesis committee, and an oral defense of the research work), or a project resulting in fabrication of a prototype and publication of refereed article. Students will work with designated faculty to formulate, develop, and complete the project, thesis, or exam. The completion of the Capstone Course is designed to document significant evidence that all Program Outcomes have been met and provides the student evidence of experience to show to current and prospective employers. The Capstone Course must be taken at the end of the student's degree program. Prerequisite: All Master of Science in Unmanned and Autonomous Systems degree program curriculum. ***Prerequisite: UAS-710.*** (3)

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Resources

Calendars

Fall Semester 2021
Undergraduate (UG) and Graduate (GR) Classes
Semester-long Classes

Aug. 25-27	Orientation, registration, and residence hall check-in for new students
Aug. 28	Residence hall check-in for returning students
Aug. 30	Classes begin Last day for 100% refund First tuition installment due – UG First 50% tuition installment due – GR Library opens
Sept. 6	**Labor Day – University Closed (All classes meet asynchronously)**
Sept. 7	Electronics, physics and chemistry labs open Student Success Center opens
Sept. 13	Last day for 75% refund Last day to add a course
Sept. 20	Last day for 50% refund
Sept. 27	Last day for 25% refund Last day to drop without a W Second tuition installments due – UG Final 50% tuition installment due - GR
Sept. 27-Oct. 4	Financial Aid Disbursement Week/Pell Census
Oct. 8	Career Conference
Oct. 18-22	Midterm Examinations - UG
Oct. 25	Final tuition installment due - UG
Nov. 1	Last day to drop course with W or change to audit
Nov. 22-26	Fall reading days (All classes meet asynchronously)
Nov. 24-26	**Thanksgiving – University Closed**
Dec. 10	Classes end - UG Electronics, physics and chemistry labs close Student Success Center closes All library materials are due Last day to withdraw from all classes
Dec. 13-17	Final examinations - UG
Dec. 17	Classes end - GR Library closes Residence halls close at 5 p.m.
Dec. 23-24	**Christmas - University Closed**
Dec. 30-31	**New Year - University Closed**

Fall Semester 2021 Undergraduate and Graduate Classes
Fall – Term I

Aug. 30	Classes begin
	Last day for 100% refund
	First tuition installment due – UG & GR
Sept. 6	**Labor Day – University Closed (All classes meet asynchronously)**
Sep. 7	Last day for 75% refund
	Last day to add a course
Sept. 13	Last day for 50% refund
Sept. 20	Last day for 25% refund
	Last day to drop or audit course
Sept. 27	Final tuition installment due – UG & GR
Oct. 15	Last day to withdraw from all classes
Oct. 22	Classes end – UG & GR

Fall – Term II

Oct. 25	Classes begin
	Last day for 100% refund
	First tuition installment due – UG & GR
Nov.1	Last day for 75% refund
	Last day to add a course
Nov. 8	Last day for 50% refund
Nov. 15	Last day for 25% refund
	Last day to drop or audit course
Nov. 22	Final tuition installment due – UG & GR
Nov. 22-26	Fall reading days (All classes meet asynchronously)
Nov. 24-26	**Thanksgiving – University Closed**
Dec. 10	Last day to withdraw from all classes
Dec. 17	Classes end – UG & GR
Dec. 23-24	**Christmas - University Closed**
Dec. 30-31	**New Year - University Closed**

Spring Semester 2022
Undergraduate (UG) and Graduate (GR) Classes
Semester-long Classes

Jan. 3	University opens
	Residence hall check-in for new students
	Residence hall check-in for returning students
	Orientation for new students
Jan. 4	Classes begin

	Last day for 100% refund
	First tuition installments due – UG
	First 50% tuition installment due – GR
	Library opens
	Graduation applications due for Class of 2022
Jan. 10	Electronics, physics and chemistry labs open
	Student Success Center opens
January 14	Monday Classes Meet
Jan. 17	**Martin Luther King Jr. Day – University Closed (All classes meet asynchronously)**
Jan. 18	Last day for 75% refund
	Last day to add a course
Jan. 24	Last day for 50% refund
Jan. 31	Last day for 25% refund
	Last day to drop course without W grade
	Second tuition installments due – UG
	Final 50% tuition installment due - GR
Jan. 31-Feb.7	Financial Aid Disbursement Week/Pell Census
Feb. 21-25	Midterm Examinations - UG
Feb. 25	Career Conference
Feb. 28	Final tuition installment due - UG
Mar. 7-11	Spring reading days (All classes meet asynchronously)
Mar. 11	**Faculty and Staff Appreciation Day - University Closed**
Mar. 14	Classes resume
	Last day to drop course with W or change to audit
April 15	Classes end - UG
	Last day to withdraw from all classes
	Electronics, physics and chemistry labs close
	Student Success Center closes
	All library materials are due
Apr. 18-22	Final examinations - UG
Apr. 22	Classes end - GR
	Library closes
	Residence halls close at 5 p.m.
April 30	Commencement

Resources

Spring Semester 2022 Undergraduate and Graduate Classes
Spring – Term I

Jan. 3	University opens
Jan. 4	Classes begin
	Last day for 100% refund
	First tuition installment due – UG & GR
	Graduation applications due for Class of 2022
Jan. 10	Last day for 75% refund

	Last day to add a course
Jan. 14	Monday Classes Meet
Jan. 17	**Martin Luther King Jr. Day – University Closed (All classes meet asynchronously)**
Jan. 18	Last day for 50% refund
Jan. 24	Last day for 25% refund
	Last day to drop or audit course
Jan. 31	Final tuition installment due – UG & GR
Feb. 18	Last day to withdraw from all classes
Feb. 25	Classes end – UG & GR

Spring – Term II

Feb. 28	Classes begin
	Last day for 100% refund
	First tuition installment due – UG & GR
Mar. 7	Last day for 75% refund
	Last day to add a course
Mar. 7-11	Spring reading days (All classes meet asynchronously)
Mar. 11	**Faculty and Staff Appreciation Day - University Closed**
Mar. 14	Last day for 50% refund
Mar. 21	Last day for 25% refund
	Last day to drop or audit a course
Mar. 28	Final tuition installment due – UG & GR
April 15	Last day to withdraw from all classes
April 22	Classes end – UG & GR
April 30	Commencement

Summer Semester 2022
Undergraduate (UG) and Graduate (GR) Classes
Semester-long Classes

April 30	Commencement
May 2	Classes begin
	Last day for 100% refund
	First tuition installments due – UG
	First 50% tuition installment due - GR
	Library opens
May 9	Electronics, physics and chemistry labs open
May 16	Last day for 75% refund
	Last day to add a course
May 23	Last day for 50% refund
May 30	**Memorial Day – University Closed (All classes meet asynchronously)**
May 31	Last day for 25% refund

Resources

	Last day to drop course without W grade
	Second tuition installments due – UG
	Final 50% tuition installment due - GR
May 31-June 6	Financial Aid Disbursement Week/Pell Census
June 20	**Juneteenth Observed - University Closed (All classes meet asynchronously)**
June 20-24	Midterm Examinations - UG
July 1-4	**Independence Day – University Closed (All classes meet asynchronously)**
July 11	Last day to drop course with W or change to audit
July 25-29	Summer reading days (All classes meet asynchronously)
Aug. 1	Final tuition installment due – UG
Aug. 12	Classes end - UG
	Electronics, physics and chemistry labs close
	All library materials are due
	Last day to withdraw from all classes
Aug. 15-19	Final examinations - UG
Aug. 19	Classes end – GR
	Library closes
	Residence halls close at 5 p.m.

Summer Semester 2022 Undergraduate and Graduate Classes
Summer – Term I

April 30	Commencement
May 2	Classes begin
	Last day for 100% refund
	First tuition installment due – UG & GR
May 9	Last day for 75% refund
	Last day to add a course
May 16	Last day for 50% refund
May 23	Last day for 25% refund
	Last day to drop or audit course
May 30	**Memorial Day – University Closed (All classes meet asynchronously)**
May 31	Final tuition installment due – UG & GR
June 17	Last day to withdraw from all classes
June 20	**Juneteenth Observed - University Closed (All classes meet asynchronously)**
June 24	Classes end – UG & GR

Summer – Term II

June 27	Classes begin
	Last day for 100% refund

	First tuition installment due – UG & GR
July 1-4	**Independence Day – University Closed (All classes meet asynchronously)**
July 5	Last day for 75% refund
	Last day to add a course
July 11	Last day for 50% refund
July 18	Last day for 25% refund
	Last day to drop or audit course
July 25-29	Summer reading days (All classes meet asynchronously)
Aug. 1	Final tuition installment due – UG & GR
Aug. 12	Last day to withdraw from all classes
Aug. 19	Classes end – UG & GR

Fall Semester 2022
Undergraduate (UG) and Graduate (GR) Classes
Semester-long Classes

Aug. 24-26	Orientation, registration, and residence hall check-in for new students
Aug. 27	Residence hall check-in for returning students
Aug. 29	Classes begin
	Last day for 100% refund
	First tuition installment due – UG
	First 50% tuition installment due – GR
	Library opens
Sept. 5	**Labor Day – University Closed (All classes meet asynchronously)**
Sept. 6	Electronics, physics and chemistry labs open
	Student Success Center opens
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
	Last day to drop without a W
	Second tuition installments due – UG
	Final 50% tuition installment due - GR
Sept. 26-Oct. 3	Financial Aid Disbursement Week/Pell Census
Oct. 7	Career Conference
Oct. 17-21	Midterm Examinations - UG
Oct. 24	Final tuition installment due - UG
Oct. 31	Last day to drop course with W or change to audit
Nov. 21-25	Fall reading days (All classes meet asynchronously)
Nov. 23-25	**Thanksgiving – University Closed**
Dec. 9	Classes end - UG
	Electronics, physics and chemistry labs close
	Student Success Center closes

Resources

	All library materials are due
	Last day to withdraw from all classes
Dec. 12-16	Final examinations - UG
Dec. 16	Classes end - GR Library closes
	Residence halls close at 5 p.m.
Dec. 23-26	**Christmas - University Closed**
Dec. 30-Jan.2	**New Year - University Closed**

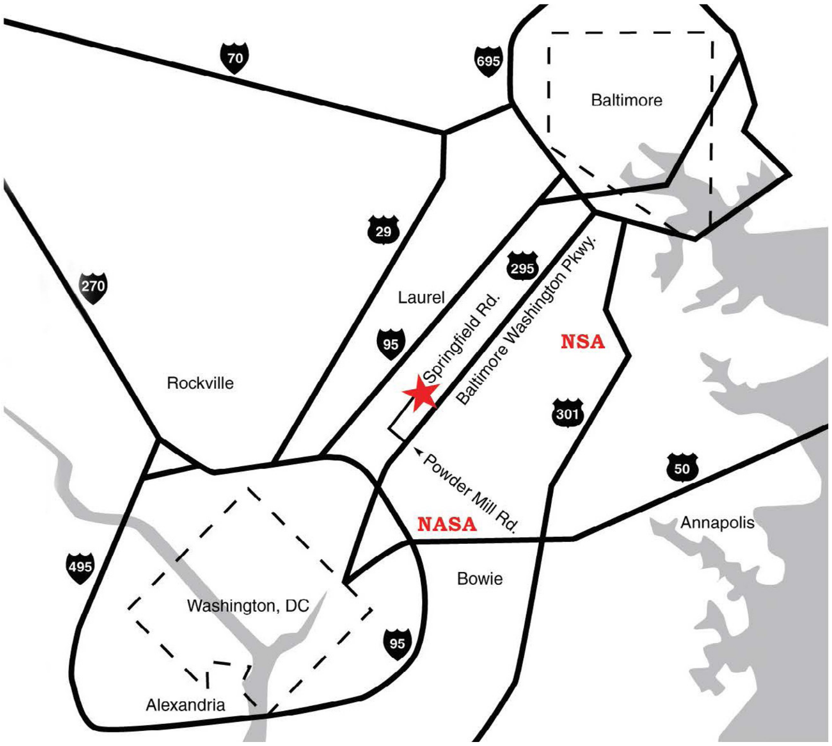
Fall Semester 2022 Undergraduate and Graduate Classes
Fall – Term I

Aug. 29	Classes begin
	Last day for 100% refund
	First tuition installment due – UG & GR
Sept. 5	Labor Day – University Closed (All classes 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
	Last day to drop or audit course
Sept. 26	Final tuition installment due – UG & GR
Oct. 14	Last day to withdraw from all classes
Oct. 21	Classes end – UG & GR

Fall – Term II

Oct. 24	Classes begin
	Last day for 100% refund
	First tuition installment due – UG & GR
Oct. 31	Last day for 75% refund
	Last day to add a course
Nov. 7	Last day for 50% refund
Nov. 14	Last day for 25% refund
	Last day to drop or audit course
Nov. 21	Final tuition installment due – UG & GR
Nov. 21-25	Fall reading days (All classes meet asynchronously)
Nov. 23-25	**Thanksgiving – University Closed**
Dec. 9	Last day to withdraw from all classes
Dec. 16	Classes end – UG & GR
Dec. 23-26	**Christmas - University Closed**
Dec. 30-Jan.2	**New Year - University Closed**

Map and Directions



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.

Capitol Technology University

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Resources