Harrisburg University

Of Science and Technology

Graduate Catalog

2022-2023

with November Addendum

The provisions of this Catalog, and its electronic version at www.HarrisburgU.edu, are not to be considered as an irrevocable contract between Harrisburg University of Science and Technology and the student. The University reserves the right to change any policy, provision or requirement at any time. This right to change a policy, provision or requirement includes, but is not limited to, the right to revise, reduce, or eliminate course offerings in academic programs, to change the medium of how courses and/or degrees are offered, and to add requirements for graduation. The student is responsible for adhering to the requirements, rules, policies and procedures, whether published in this Catalog, the Student Handbook, or other official media.

Table of Contents

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UndergraduateAdmissions@HarrisburgU.edu

Graduate Admissions
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HU Online Program Admissions
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HUOnlineAdmissions@harrisburgu.edu

Financial Aid
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Advancement Office
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Connect@HarrisburgU.edu

Finance & Administration
717.901.5105
Business Office Student Portal
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Experiential Learning
717.901.5100 ext 1714
Explearning@harrisburgu.edu

Veterans School Certifying Official
717.901.5136
RegHelp Student Portal (https://reghelp.harrisburgu.edu/)

Harrisburg University Security
717.901.5180
HUSecurity@HarrisburgU.edu

Additional Locations:
1500 Spring Garden Street, Suite 101
Philadelphia, PA 19130
717.901.5100, ext. 0127

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International Student Office
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ISOHelp Student Portal (https://isohelp.harrisburgu.edu/)

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717.901.5136
RegHelp Student Portal (https://reghelp.harrisburgu.edu/)

Student Services
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StudentServices@HarrisburgU.edu

Graduate Student Services
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Graduate Student Services Student Portal
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Career Services
717.901.5100 ext 1687
Careerservices@harrisburgu.edu

Compliance
Compliance@HarrisburgU.edu

About the Catalog

This University Catalog is updated annually and made available in electronic form on the Harrisburg University website at https://hucatalog.harrisburgu.edu/. The University website also contains updated lists of courses, course descriptions, textbook adoptions, and other important information. Should you require a paper copy of the catalog, please contact Records and Registration at the RegHelp Student Portal (https://reghelp.harrisburgu.edu/support/home) or 717-901-5136.

Harrisburg University has made every effort to make this catalog accurate; however, all policies, procedures or charges are subject to change at any time by appropriate action of the faculty, administration, or Board of Trustees. Each edition of the University's catalog is archived in the library.

The University

History

The University was incorporated in the Commonwealth of Pennsylvania on December 12, 2001, making it the first science- and technology-focused, non-profit, comprehensive university to be established in Pennsylvania in more than 100 years. Founded to address the Capital Region's need for increased educational opportunities in science, technology, engineering and mathematics (STEM) careers, Harrisburg University represents a major step to attract, educate, and retain Pennsylvania's diverse 21st century knowledge-based workforce. A grand concept that was championed by business leaders, government officials, and the regional news media, Harrisburg University was built from concept to reality in less than a decade. The Pennsylvania Department of Education granted the University its charter in 2005.

An independent institution, the University offers academic and research programs designed to meet the needs of the region's youth, workforce and businesses. The University serves as a catalyst for creating, attracting an expanding economic development and opportunities in Central Pennsylvania by aligning traditional undergraduate, graduate, and doctorate degrees with science and technology-based experiential learning.

Mission Statement

The Harrisburg University of Science and Technology offers innovative academic and research programs in science and technology that respond to local and global needs. The institution fosters a diverse community of learners, provides access and support to students who want to pursue a career in science and technology, and supports business creation and economic development. *Approved by the Board of Trustees on September 17, 2015.*

Vision

Founded to address the need of Pennsylvania's Capital Region for increased educational opportunities in applied science and technology-related fields, the vision of Harrisburg University of Science and Technology is to provide academic programs at undergraduate and graduate levels for a diversity of learners, using student-centered, technologically advanced, and experiential learning designs that emphasize student success, with a sharp focus on specific interdisciplinary competencies and strong linkages to career development. The desired outcome is the emergence of well-qualified, technically expert graduates whose understanding of applied science and technology-related fields is honed by direct industry experience and rounded by a sound, cross-disciplinary liberal education.

Accreditation and Approvals

Harrisburg University of Science and Technology was re-accredited on March 3, 2016 by the Middle States Commission on Higher Education, 3624 Market Street, Philadelphia, PA 19104, (267) 284-5000. 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. The Doctor's Research Scholarship degree program (Ph.D. in Data Sciences) was granted by Middle States on January 4, 2017.

Program offerings are authorized by the Pennsylvania Department of Education, Division of Higher and Career Education, 333 Market Street, Harrisburg, PA 17126.

Approved to participate in the federal Title IV, HEA student assistance programs by the U.S. Department of Education, 400 Maryland Avenue, SW, Washington, DC 20202.

Approved by the Pennsylvania Department of Education for veterans and eligible dependents to obtain education benefits through the Veteran's Administration (VA). Approved by the Veterans Administration to participate in the "Yellow Ribbon" program.

Authorized under federal law by the Department of Homeland Security - U.S. Immigration and Customs Enforcement (DHS-USCIS-SEVP) as an eligible institution for the Student and Exchange Visitor Information System (SEVIS) to enroll non-immigrant students.

The Master of Science in Project Management program is accredited by the Global Accreditation Center from the Project Management Institute, 14 Campus Boulevard, Newtown Square, PA (855-746-4849). The M.S. program in Project Management is one of only 110 programs around the world to achieve this accreditation. The Global Accreditation Center (GAC) for Project Management Education Programs is an independent academic accreditation body with policies, procedures, and standards for project, program, portfolio management and related programs.

The Computer and Information Sciences undergraduate program has been awarded ABET accreditation, a prestigious standard that guarantees HU CISC graduates are prepared to excel and lead in their field. ABET, a nonprofit organization, accredits college and university programs in applied and natural science, computing, engineering, and engineering technology at the associate, bachelor, and master degree levels. ABET-accredited programs meet the quality standards that produce graduates prepared to enter a global workforce.

The Maryland Higher Education Commission granted approval of an authorization to operate at the Southern Maryland Higher Education Center for the Master of Science in Learning Technologies and Master of Science in Information Systems Engineering and Management degree programs.

The baccalaureate degree program in nursing and the master's degree program in nursing at Harrisburg University of Science and Technology are accredited by the Commission on Collegiate Nursing Education (http://www.ccneaccreditation.org).

Student Responsibility Statement

A student has the responsibility to engage fully in assigned work, to be interactive in academic discussion, and to develop professional competencies both in the classroom and at internship sites. The University is new in both thought and ideas. The student should be a partner in this endeavor, now and in the future.

It is the student's responsibility to be engaged in the University's community of learners and to develop a strong professional and ethical foundation as a community member. Failure to uphold HU's rules and policies, as well as federal, state, or local laws and/or regulations, may result in disciplinary action by HU pursuant to its Code of Student Conduct (Code).

Statement of Community Values

Underlying HU's mission are basic behavioral standards that must be respected and adhered to by all HU employees as a basic tenant of their employment. These standards include, but are not limited to:

- the importance of personal integrity, honesty, and ethical decision making;
- the right of every individual to be treated with respect and dignity as members of a learning organization;
- the freedom of intellectual inquiry in the pursuit of truth, even if it defies commonly understood theories;
- the acceptance and appreciation of diversity regarding race, gender, religion, sexual orientation, age, ability, ethnicity, and political views;
- the freedom from violence aimed at limiting, interfering with, or disrupting HU activities; and

- a recognition that civic engagement is a component of the intellectual development of students and provides a path for knowledge in the service of the community

Admissions

The University has a centralized Admissions Office to serve all prospective student applicants - undergraduate, graduate and non-degree. This centralized structure honors the University's commitment to lifelong learning and to offer a more fluid and comprehensive service for those seeking access to a quality educational experience.

Graduate Philosophy

Harrisburg University of Science and Technology seeks to admit graduate program students from a variety of backgrounds. The University considers many factors in the review of applicant files and generally admits the qualified individual who has completed a baccalaureate degree with related undergraduate coursework, or those who have a baccalaureate degree but possess related professional experiences or potential.

Graduate education focuses on individualized career advancement in high-growth and high-demand areas of study within science, technology, engineering, management, and mathematics disciplines. This is accomplished by making certain that each student is completely engaged to gain knowledge at an advanced level, is able to specialize or generalize knowledge and skills according to needs and interests and applies what is learned and researched to both practical and professional experience. This is also accomplished by involving corporate faculty members who bring a practical and academic perspective to the program and courses in the design, development and delivery of graduate education. This program is designed for working professionals focused on career advancement and who need flexibility of access and timeliness of content and delivery.

Doctorate Philosophy

Harrisburg University of Science and Technology seeks to admit doctorate program students from a variety of backgrounds. The University considers many factors in the review of applicant files and generally admits the qualified individual who has completed a graduate degree with related graduate coursework, or those who have a graduate degree but possess related professional experiences or potential.

The doctoral program at Harrisburg University focuses on enabling students to make original contributions to their respective fields of study. There are two phases of the doctoral program at Harrisburg University, an initial learning phase that can include coursework, seminars, research, and fieldwork that contributes to the student's knowledge in the program of study; and a second research phase that focuses on student's original research culminating in the final dissertation defense. Upon a student's defense of the dissertation and completion of all other graduate requirements, the student will be awarded the doctoral degree in the program of study.

Graduate Admission Process

There is no application deadline. Graduate program applicants are encouraged to apply at least two months prior to the start of any semester. This application process allows ample time to be accepted, develop an academic schedule, and to process financial aid applications (if applicable). The University uses a portal system for the secure transmission of documents.

Graduate Admission Requirements

Each applicant's candidacy will be evaluated once all admissions materials have been received.

The graduate admission process requires the candidate to:

- complete the application online at www.HarrisburgU.edu/Apply;

- submit final official undergraduate transcript(s) from the college or university at which a baccalaureate degree was conferred, and any other institution of higher education attended (whether or not academic credit was earned);
- submit a personal goal statement including:
    - future goals: identify career/professional goals; and,
    - leadership or group contributions: describe examples of leadership experience in which you have significantly influenced others, helped resolve disputes, or contributed to group efforts over time;
- submit a resume;
- see programs for additional admission requirements, if any.

Doctorate Program Admission Process

Doctorate program applicants are encouraged to apply at least six months prior to the start of any semester. This application process allows ample time for acceptance and development of an academic schedule. The Admission Committee reviews all documents and will request an interview with the applicant prior to making an admission decision for a limited number of applicants to become resident or non-resident candidates for the degree.

Doctorate Admission Requirements

A faculty admission committee will evaluate each applicant's candidacy once all admissions materials have been received. The doctorate admission process requires the candidate to:

- Complete the application online at www.HarrisburgU.edu/Apply.
- Write an essay (in English) on how this degree supports the candidate's academic and career aspirations.
- Submit final official transcript(s) from the college or university at which the highest degree earned was conferred.
- Submission of an official record of Graduate Record Examination scores (GRE) is recommended for Computational Sciences and Data Science programs, it is required for the Information Systems Engineering and Management program.
- Provide two letters of recommendation from academic or industry professionals.
- Submit a resume.
- Assemble all the above required documents into a zipfolder and email to PhD@HarrisburgU.edu.
- A faculty review committee may select the candidate for an interview.
- Individual programs may have additional admissions requirements beyond those listed here. Please see additional requirements listed with individual academic programs.

International Students

An international student planning to attend the University on a student (F-1) visa must satisfy the appropriate admissions requirements and procedures, demonstrate proficiency in the English language, and provide an affidavit of financial support (bank statement of $26,500 USD or affidavit of support if applicable; applicants with dependents and children must show additional financial support of $5,000 for a spouse, and $2,500 per child).

Academic records should include courses studied, grades earned, diplomas, certificates, and results of comprehensive national examinations. International students must request an evaluation of their international transcripts through the World Education Services (WES), Educational Credential Evaluators (ECE), or AACRAO's Electronic Database for Global Education (EDGE) to determine authenticity and degree

A demonstration of English language proficiency is required of any student who is not a United States citizen. Acceptable demonstrations would include one of the following:

- completed an undergraduate college degree program from a regionally accredited United States institution of higher education;
- completed a full-time semester of graduate studies from a regionally accredited United States institution of higher education with a 3.0 or higher GPA;
- scoring above average on the Analytical Writing section of the Graduate Record Examination (GRE);
- earning a TOEFL score of 80 or higher on the web-based version, 200 on the computer version, or 520 on the paper version;
- earning an IELTS score of 6.0 or higher; or
- earning an overall score of 105 or higher on the Duolingo English Test.

Harrisburg University of Science and Technology is authorized under federal law to enroll non-immigrant alien students.

This approval allows an international student to apply for entry into the United States for study on an F-1 visa only after a complete application package is received and an "Affidavit of Financial Support" is deemed sufficient by the University. HU requires a tuition deposit payment of at least $1,000 toward the first semester's tuition to issue an I-20. The SEVIS I-901 fee of $350 is then paid by the student directly to SEVIS prior to attending a Consulate visit for the F1 visa.

Following entry into the United States and arrival at the University, the student will be required to provide a copy of the passport, I-20, and I-94 arrival/departure record all identification information in SEVIS. An international student is obligated to notify HU should their status change during enrollment from F-1 to any other immigration status. HU will revocate a student's I-20 for failure to remain eligible as required by the terms of the F-1 visa.

An international student does not qualify for Federal or State financial aid. Private education loans through participating lenders may be available, if eligible.

If a student is transferring a SEVIS, it must arrive one day prior to the start of the semester. Otherwise, Registration will withdraw the student from classes and defer the student to the subsequent semester. Submit an online SEVIS transfer recommendation request at http://www.HarrisburgU.edu/SEVISTransfer.

It is imperative that the student contact the International Student Office at the SEVP-certified institution where the student's SEVIS record currently resides. The student must notify a DSO/ International Student Advisor at their current school and let them know that the student would like to have their SEVIS record transferred to HU. Every school has its own way of processing such requests, so the student should abide by their school's policy when requesting to be transferred out. The student will need to provide a copy of their HU letter of acceptance to the International Student Advisor at their current school and let them know that they will be receiving an electronic transfer form via email.

Masters Non-Degree Students

Masters Non-Degree Status Admission Process

Each applicant's candidacy will be evaluated once all admissions materials have been received. Offers of admission are made to qualified applicants on a rolling basis.

Complete the non-degree application online at www.HarrisburgU.edu/Apply or a paper application.

If required by a specific certificate or non-degree program, submit final official undergraduate transcript, providing evidence of completion of a bachelor's degree program.

Masters Non-Degree Status Policies

An applicant should enroll under non-degree status when undecided about a graduate-level major or program, not interested in earning a master's degree, interested only in graduate-level professional development courses such as Educator Technology Clinics, or completing work with the intention of transferring the credit earned to another institution.

Non-degree applicants must have earned an undergraduate degree from an accredited institution. A student may apply no more than 12 graduate semester hours completed under non-degree status to a graduate degree program at the University. Non-degree status does not guarantee admission into a degree program. A student must maintain a 2.00 cumulative grade point average to remain enrolled.

An applicant whose native language is not English must submit his or her scores from the Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) or Duolingo English Test. Please see the HU website at https://www.harrisburgu.edu/admissions/international-admissions/ for a list of countries with English as their primary language and may be exempt from providing an English Proficiency exam. See following section for specifics.

Graduate Readmission

The Readmission Application Form is available at Records and Registration and must be completed and submitted to that office at least two weeks before the start of the semester. A student who was in good academic standing had satisfied all financial obligations to the University at the time of withdrawal, and had no disciplinary sanctions imposed will be readmitted. A student who left the University on academic warning, probation, or dismissal can only apply for readmission after an absence of one year. The application will be reviewed by a committee appointed by the Provost, who will make the readmission decision. A student who leaves the University and returns from an absence of one year or more will be subject to the Catalog edition in effect during the year of return.

Doctorate Readmission

The Readmission Application Form is available at Records and Registration and must be completed and submitted to that office at least two weeks before the start of the semester. A student who left the University on academic warning, probation, or dismissal can only apply for readmission after an absence of one year. Despite the student's academic standing at the time of departure from the university, a student reapplying for admission to the doctorate program is not guaranteed readmission due to the selectivity of the program. The application will be reviewed by a committee appointed by the Provost, who will make the readmission decision. A student who leaves the University and returns from an absence of one year or more will be subject to the Catalog edition in effect during the year of return.

Tuition Charges, Refund Policies and Business Office Policies

All graduate tuition, charges and policies listed in this publication are effective as of July 1, 2022 and are subject to change, without notice, by the University's Board of Trustees.

Admission Application Charge

There is no charge to apply for admission to the University.

Tuition Deposit

A non-refundable tuition deposit must be paid in advance of course registration for the initial semester of attendance.

Tuition Schedule

Tuition payment or satisfactory arrangement to pay tuition, which includes financial aid resources, is due generally one week prior to the beginning of the semester. Tuition is charged according to the tuition schedule shown below.

Full-time undergraduate tuition charges are for 12 to 17 semester hours. A student registered for more than 17 semester hours is subject to an overload charge at the per-semester hour rate. For example, tuition charges for 18 semester hours will include the full-time rate of $11,950 plus $1,000 for the additional semester hour, resulting in a charge of $12,950. A part-time undergraduate student registered for 11 semester hours or fewer is charged the per-semester hour rate multiplied by the number of registered semester hours.

Graduate students are charged a per-semester hour rate plus a flat semester fee. For example, a graduate student registered for 6 semester hours is charged the per-semester hour rate of $830 multiplied by the number of registered semester hours ($4,980) plus the $500 flat semester fee, resulting in a charge of $5,480.

Tuition Schedule			
		Per Credit	Flat Fee Per Semester
Undergraduate			
	Part-Time (0-11 Credits)	1,000.00	-
	Full-Time (12-17 Credits)	-	11,950.00
	Full-Time Overload (18+ Credits)*	1,000.00	11,950.00
	Dual Enrollment (1-11 Credits)	200.00	-
	College in the High School	100.00	-
	*Per credit charge applies to the number of credits that exceed 17.		
Graduate			
	Master's Programs	830.00	500.00
	Doctoral Programs**	830.00	500.00
	**For doctoral students, the tuition charge after 12 earned credits of the Doctoral Studies courses is $415 per credit. All other courses remain billed at standard tuition rates.		
HU Online Programs			
	Undergraduate	380.00	-
	Graduate	650.00	-

Tuition Payments

Payments may be made in the Business Office by cash, check, or money order. Electronic payment options including credit card, debit card, and electronic check/ACH are available online only via the Finance page of MyHU. A preregistered student can view account information online. A convenience fee of 2.75% will be added for any credit/debit card transactions involving student tuition payments or other services. Online ACH/electronic check payments will not incur a convenience fee.

Graduate Assistantships

A graduate assistantship may be awarded to support the full-time doctoral student who works for faculty in research or as a teaching assistant. Duties may include serving on research teams; collecting, cleaning and analyzing datasets; preparing research publications or grant proposals; lecturing; grading, office hours, and other researching, teaching, or administrative tasks. An assistantship can include an annual stipend and the option to purchase health coverage through the University healthcare plan. An assistantship is awarded based on demonstrated need, academic potential, and faculty recommendation.

Computer Requirements

All programs involving face-to-face or 'in-class' instruction require a laptop computer to be obtained prior to the first day of class. For any fully online programs or for any secondary machine, students are free to use desktop computers that meet the requirements listed on the University's website at https://harrisburgu.edu/it-resource-center/. The cost is approximately $700 to $1,200.

Please note, these are the minimum requirements for the Office365 desktop software. There may be additional degree program software requirements. Some program software may be operating system dependent. Check with your advisor or program director for more information before you make any computer purchasing decisions.

Textbooks

Textbooks and other supplies (if specified for a course) must be obtained by the student prior to the first day of class. Textbooks may include bound books, ebooks, journals, or software. Supplies may include a laboratory coat, goggles, gloves or any other required item specified. The estimated cost for textbooks and other supplies per course is $75. Students can find textbook information at http://bookstore.mbsdirect.net/harrisburgu.htm. Some courses have textbooks or learning materials embedded in the course structure, provided at no additional cost.

Prior Learning Assessment Charge

A student who submits an application for prior learning assessment is charged per semester hour amount of $350 for the number of semester hours of the course equivalent sought. This charge is imposed at the time of application. No refund will be made if the application is unsuccessful.

Other Charges

Tuition Payment Late Charge - A late payment charge of $250 will be assessed if the student fails to make payment arrangements or pay tuition on or before the payment due date.

Returned Check Charge - A charge of $20 will be assessed if a check or electronic check/ACH transaction processed for payment is returned by the issuing bank.

Campus ID Card Replacement Charge - Upon enrollment, a student receives, at no cost, a photo-imprinted Campus ID Card to be used as an identification badge, as a library card, and for building and elevator access. A student is required

to wear the Campus ID Card badge when on campus. If a student desires a photo ID, submission of a 2" x 2" photo is required and a charge of $25 is assessed to replace the card. If a Campus ID Card is lost or stolen, a charge of $25 is assessed to replace the card.

Pay to Print Charge - On-campus printing is available to the student. A charge may be assessed depending upon the nature of the print job: paper size, ink color, and quantity.

Commencement Fee - A charge of $65 (the charge is based on the cost of the cap, gown, and tassel at time of graduation) will be assessed for the student participating in the Commencement Ceremony.

Transcript Requests - The National Student Clearinghouse (NSC) provides an online transcript ordering service for Harrisburg University students and alumni 24 hours a day, 7 days a week. Please click the link below to order your transcripts: National Student Clearinghouse Transcript Services. Transcripts are processed during business hours within two business days of placing your order. Each official transcript requested will be charged $10.00 per transcript for standard domestic delivery.

Withdrawal Policy

Full Withdrawal Refund Schedule		
A student who fully withdraws from all courses at the University may qualify for a credit of the unearned portion of the tuition charge. For refund purposes, the semester begins on the first day of the semester, subterm, or session, regardless of the student's first class day of attendance during week one. The period of time used to calculate the tuition refund is the first day of class of the semester to the University's determination date of official or unofficial withdrawal. The refund policy applies to tuition charged and does not apply separately to the various types of payments credited to the student's account. Please see the Academic Calendar at https://harrisburgu.edu/academic-calendar for specific semester start dates and withdrawal deadlines.		
14 Week Semesters		
There is a 100% tuition refund when a student fully withdraws during the add/drop period and a refund schedule for withdrawals occurring in the first three weeks of the semester.		
	Prior to the first day of the semester	100%
	Prior to the end of add/drop	100%
	During the second week	50%
	During the third week	25%
	After the third week	0%
7 Week Subterms/Sessions including HU Online Programs		
There is a 100% tuition refund when a student fully withdraws during the add/drop period, but no tuition refund when a student withdraws after the add/drop period.		
	Prior to the first day of the module	100%
	Prior to the end of add/drop	100%
	After add/drop	0%

Tuition Add/Drop Policy

Tuition Add/Drop Policy
If a student adds or reduces the number of courses and/or semester hours during the published add/drop period, tuition will be recalculated based on the adjusted number of semester hours. There is no tuition refund when a student withdraws from one or more courses after the add/drop period but remains enrolled in one or more other scheduled courses.

Federal Student Financial Aid Program Refund Calculation

Refunds are calculated upon official withdrawal from all classes and, if the student was deemed eligible for Title IV, Higher Education Act (HEA) student financial assistance program funds, any refund due will be paid within 45 days from the date the student is determined to have withdrawn.

A student who officially withdraws up to the 60 percent point in time of the semester will incur an adjustment to the amount of financial aid program funds awarded and/or disbursed for the term based on the percentage of time attended from the first day of class to the University's determination date of withdrawal. If a student officially withdraws after the 60 percent point in time of the 14-week semester, 100 percent of the student's financial assistance program awards are considered earned and will be applied to the total amount of institutional charges due for the term. The refund order of Title IV, HEA program funds (as applicable to the student) is: Unsubsidized Direct Loans; Subsidized Direct Loans; Direct PLUS Loans; Federal Pell Grants; and, Federal Supplemental Educational Opportunity Grant (FSEOG).

For a student who unofficially withdraws during a semester, the withdrawal date shall be the end of the semester. The student is then responsible for all tuition charges due resulting from this reduction in awards and/or payments previously credited to the student's account.

In the event that the financial aid recalculation results in an amount to be returned that exceeds the school's portion, the student will be required to repay some funds directly to the U.S. Department of Education.

In the event that a financial aid recalculation results in all outstanding tuition and fees being paid, resulting in a credit balance on the student's account, this credit balance will be refunded to the student within 14 days of the financial aid recalculation date. All refunds are sent by check via U.S. mail.

In accordance with federal regulations, if a student receives all F grades during a semester, the University is required, at the best of its ability, to perform an attendance review to determine if a student ceased attendance during the semester. If it can be definitively determined that a student stopped attending prior to the 60 percent point of the semester, as indicated above, the student will incur an adjustment to the amount of financial aid program funds awarded and/or disbursed for the term based on the percentage of time attended from the first day of class to the University's determination that the student stopped attending.

Post-Withdrawal Disbursements: A student may qualify for a post-withdrawal disbursement of their financial aid if the aid earned is more than the amount disbursed to them. The Financial Aid Office will notify a student of their potential eligibility with a post-withdrawal notification letter, sent both email and U.S. mail. The student will have 14 days from the date of the letter to accept or decline the post-withdrawal disbursement. If no response is received from the student, the post-withdrawal disbursement will be forfeited. The University will offer any post-withdrawal disbursement of loan funds within 30 days of the date the school determined the student withdrew. The University will also return any unearned funds and make a post-withdrawal disbursement of grant funds within 45 days of the date the school determined the student withdrew. Finally, if a student withdraws and is entitled to a post-withdrawal disbursement, it will be applied to charges still owed to the University, and any excess will be refunded to the student.

Veteran Student Tuition and Fees Policy

Pursuant to Section 103 of the Veterans Benefits and Transition Act of 2018, a student who is entitled to education assistance under chapter 31-Vocational Rehabilitation and Employment, or chapter 33-Post 9/11 GI Bill® benefits will be permitted to attend and participate in the course of education during the period beginning on the date in which the student submits a written request to use such entitlement and ending on the earlier of the following dates:

- The date on which payment from Veterans Administration is made to the institution
- 90 days after the date the institution submitted certification of enrollment/tuition and fees to Veterans Administration

Harrisburg University will not impose any penalty, including late fees, limited access to university resources, or require additional borrowed funds on any eligible student due to the inability to meet their financial obligation to the university based on delayed disbursement of Veterans Administration funding.

A student who is entitled to education assistance under any of the available Veterans Administration Education Benefits is expected to provide the Certificate of Eligibility or Statement of Benefits to the Certifying Official no later than the start of the initial semester in which the entitlement is intended to be used. In addition, each semester the student must submit a written request (VA Benefits eForm) as confirmation of their intention to use the entitlement before the Enrollment/Tuition and Fees Certification can be reported by the Certifying Official to Veterans Administration for processing.

"GI Bill ®" is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by the VA is available at the official U.S. government website at www.benefits.va.gov/gibill.

Student Financial Aid Programs and Policies

The Office of Financial Aid assists qualified applicants who, without assistance, would otherwise be unable to pursue an advanced degree. The Free Application for Federal Student Aid (FAFSA) and resulting need analysis is used to apply for federal and state consideration for payment of tuition, housing, or other charges.

A student must apply each year to renew financial aid eligibility. The amount of financial aid awarded will reflect changes in tuition or other costs and updates to the financial profile of the student.

Financial aid awards are based on the enrollment status of the student during a semester as of the conclusion of the Add/Drop Period, defined as:

Full-time Status: 6 or more semester hours
Half-time Status: 3 semester hours

Required enrollment status for federal direct loans is half-time. A non-degree student is not eligible for financial aid.

Aid Sources

Federal Direct Loan - A Federal Direct Loan (FDL) is available to eligible borrowers. Interest accrues on the unsubsidized loan while the student is enrolled. The borrower may opt to pay the interest as it accrues or allow it to accrue and capitalize. The unsubsidized loan is a non-need based loan program. The maximum Federal Direct Loan per academic year is $10,250 per semester for an eligible degree-seeking graduate student. Maximum loan amounts per semester may also be limited based on cost of attendance. An international student attending on an F-1 visa or an international student outside the U.S. enrolled in a distance education program are not eligible to borrow a Federal Direct Loan.

Federal PLUS Loan for Graduate Students - A degree-seeking graduate student may be eligible to borrow under the PLUS Loan Program, up to the cost of attendance minus other estimated financial assistance in the Federal Direct loan (FDL) program. The terms and conditions applicable to Parent PLUS loans also apply to Graduate/Professional PLUS loans. The requirements include a determination that the applicant does not have an adverse credit history. Repayment begins 60 days after the date of graduation, withdrawal, or enrollment status below half-time. The student must have applied for the annual loan maximum eligibility under the Federal Unsubsidized Direct Loan Program before applying for a Graduate/Professional PLUS loan. An international student attending on an F-1 visa or an international student outside the U.S. enrolled in a distance education program is not eligible to borrow a Federal PLUS Loan for Graduate Students.

Other Programs - The following federal, state or private financial aid sources are available to a student based upon the individual's affiliations or experiences.

Veterans Administration Education Benefits
Pennsylvania Office of Vocational Rehabilitation
Job Training Agencies
Employer Sponsorship

Financial Aid Counseling and Financial Clearance Date

The student is encouraged to apply for federal and state grant program funding to determine the student's eligibility. A student who intends to seek federal financial aid program assistance is required to contact the Office of Financial Aid at least 30 days prior to the start of a semester to complete the application process, submit all required documents and materials requested, and finalize a financial assistance plan by the end of the Add/Drop Period. A student whose financial assistance plan is not finalized by the end of the Add/Drop Period will not be allowed to attend class.

Enrollment Status Determination

A student's enrollment status is determined at the end of the Add/Drop Period. The student is charged the applicable tuition rate for the number of semester hours in which the student is enrolled on the census date.

Satisfactory Academic Progress for Financial Aid Recipients

Satisfactory academic progress (SAP) for federal Title IV, Higher Education Act (HEA) student financial aid program assistance is defined as the minimum progress required toward the completion of a degree, and must be maintained in order to receive federal financial aid. As required by federal regulations, the Harrisburg University SAP policy for federal Title IV financial aid recipients is stricter than the University's academic progress policy for students not receiving Title IV financial aid.

It is important to note this policy applies to both full-time and less than full-time graduate students. A graduate student must be enrolled in at least 6 credits for the semester to be considered full-time. A graduate student enrolled in less than 6 credits for the semester is considered to be less than full-time.

Federal regulations require the University to establish standards of academic progress in both of the following areas:

- the student's cumulative grade point average, the qualitative measure; and,
- the maximum time limit for completing the program of study, the quantitative measure.

Satisfactory academic progress is evaluated at the end of each semester. Financial aid recipients must maintain the standards in both areas, regardless of whether aid was received in the past. A student who does not meet one or both of the standards is not making satisfactory progress until the standards are met.

A student who is academically eligible to continue enrollment at the University, but does not meet the standards of academic progress, may remain enrolled without financial aid until eligibility to receive financial aid is reestablished. A student should contact the Office of Financial Aid to discuss strategies for meeting the standards and to inquire about options for financial assistance that are not subject to the satisfactory academic progress requirements.

Transfer credit hours from another institution that are accepted toward a program of study are counted as both attempted semester hours and earned semester hours in the program pursuit calculation to determine satisfactory academic progress for Title IV, HEA student assistance program purposes. Grades for transfer credit hours are not included in the calculation of the cumulative grade point average.

Semester hours for a grade of Incomplete (I) are counted in the total attempted semester hours in the program pursuit calculation of satisfactory academic progress for Title IV, HEA student assistance program purposes. It is the student's responsibility to contact the Financial Aid office in the event of a change of grade, for example from "I" to "C", to ensure that the SAP status is reviewed for eligibility changes.

Semester hours for a Withdrawal grade (W) are considered attempted semester hours in the calculations of satisfactory academic progress for Title IV, HEA student assistance program purposes.

When a course is repeated, the attempted credit hours are used to determine the student's enrollment status for the semester (i.e., full-time, half-time, less-than-half-time), but the repeated hours are not counted a second time as attempted credit hours in the cumulative grade point average calculation. Earned semester hours and quality points for a grade used in the cumulative grade point average calculation for a course repeat are taken from the most recent grade.

Academic Standing and Financial Aid Eligibility (qualitative)

A student with a cumulative grade point average of 3.00 or higher is in satisfactory academic standing. If a student has a cumulative grade point average below 3.00 at the end of a semester, the student has failed to meet the minimum

satisfactory academic progress standard and is subject to the warning, probation or dismissal sanction, as applicable, as stated below.

After the initial semester, if at any time the cumulative grade point average falls below 1.00 the University reserves the right to dismiss the student.

Program Pursuit - Maximum Timeframe for Completing the Program of Study (quantitative)

A full-time student must successfully complete a program of study within one- and one-half times the normal time frame in semester hours attempted to continue to receive Title IV, HEA student financial aid program assistance. More simply stated, program pursuit requirements for a normal 2-year, 6 semester programs consisting of 36 semester hours must be completed successfully within 3 years (i.e., 9 semesters, 54 semester hours) to maintain eligibility for federal financial aid program assistance throughout the program of study.

The quantitative measure of satisfactory academic progress is measured using the following calculation:

Total Earned Semester Hours ÷ Total Attempted Semester Hours = a percentage (%)

Students must complete their degree within 150% of the number of credits necessary to complete the educational program. As a result, students are required to be earning a minimum of 67% of their total cumulative attempted credits at the end of each payment period to remain in good satisfactory academic progress standing.

Failure to Meet One of the Required Satisfactory Academic Progress Standards

A student who fails to meet either the qualitative or quantitative measure of satisfactory academic progress at the end of a semester is subject to the following policy:

First Occurrence - Warning

Following the first semester in which the student does not meet the satisfactory academic progress standard, the student will automatically be placed in a financial aid warning status for the next semester. A letter will be issued advising the student of their financial aid warning status. No appeal is needed, but in coordination with the Office of Student Services, an academic plan may be required. The student remains eligible for financial aid program assistance during the warning semester.

Second Consecutive Occurrence - Probation

If, by the end of the warning semester, the student is not able to achieve satisfactory academic progress status, the student will not be able to receive financial aid for the next period of enrollment unless the student successfully appeals. A letter will be issued advising the student of their financial aid status, the effect of this status on the student's financial aid eligibility, and the steps the student must take to submit an appeal. If the appeal is approved, the student will be placed in a financial aid probation status for the next semester and will be eligible for financial aid during that semester. If a student is still failing to meet academic progress at the conclusion of the probation semester, financial aid will be suspended but the student will again be given the opportunity to appeal and be approved for financial aid. In addition to an approved appeal, an academic plan would be required during this semester.

Appeals

A student who becomes ineligible to participate in the financial aid programs as a result of failure to meet satisfactory academic progress after the warning semester, may file an appeal by submitting a letter outlining the nature of the appeal to the Financial Aid Office. An appeal will be considered only if the student's failure to meet the standards of

academic progress is determined to be due to events beyond the student's control. Examples of circumstances for which an appeal may be considered include military obligation; death of a relative; injury or illness of the student; unusual personal hardship or other extenuating circumstance. Written documentation of the circumstances of why the student failed to make satisfactory progress and what has changed that will allow the student to make satisfactory progress by the next evaluation must be submitted with the appeal and should reference the student's name and student ID number. In addition, evidence must be received documenting that the required academic plan was completed, the cumulative grade point average has improved, and the required satisfactory progress grade point average can potentially be achieved to complete a program of study within the maximum timeframe limitation. Appeals submitted without documentation will not be considered. A timely determination will then be made and documented in the student's file.

If the financial aid appeal is denied, a second notice will be sent to the student advising them of the denial. If the appeal is approved, a semester of financial aid probation will be awarded. The student will be notified in writing their appeal was approved. The student must achieve satisfactory academic progress by the end of the financial aid probation semester.

If after the financial aid probation semester a student is still not making satisfactory academic progress, but is meeting the requirements of the academic plan, the student is eligible to continue to receive financial aid as long as the student continues to meet those requirements and is reviewed according to the requirements specified in the academic plan. A student becomes ineligible to receive federal funds when the student does not meet the requirements of the academic plan.

Academic Standing and Satisfactory Academic Progress Review and Notification

The University evaluates academic standing and satisfactory academic progress at the end of each semester. All students who receive federal financial aid must meet the standards for satisfactory academic progress in order to establish and retain student financial aid program eligibility. The University may establish academic policies that may be different than the policies governing academic warning, probation, and dismissal. Written notification of financial aid ineligibility is mailed to a student at the most recently reported permanent address.

Re-establishing Eligibility for Federal Student Assistance Programs

Following a dismissal action, a student may re-establish eligibility by earning course credit successfully at another institution that will directly transfer into the University's program of study and the required cumulative grade point average and maximum timeframe percentage for minimum satisfactory progress is achieved by the transfer credit and grades accepted.

Student Services

Overview

The Office of Student Services provides educational, personal, and professional support to promote student development and success. The Office of Student Services, in collaboration with other staff and faculty, enhances the mission of the University by providing an inclusive campus community, promoting leadership opportunities and providing resources and programming to facility academic success.

New Student Orientation

Orientation sessions precede each semester in order for the student to become familiar with the University, technology services, campus policies and procedures. A new student entering the University will receive information from various functional areas during the enrollment process on the availability and delivery method of orientation content.

Student Housing

Harrisburg University does not own housing facilities. The Office of Student Services can assist the student to find housing with the University's local Harrisburg partners.

Student Parking

Park UP Harrisburg (parkHarrisburg.com) operates the parking facilities in Harrisburg. Prices vary by facility. Check the website for specifics.

Tutoring and Learning Services

A student may request the assistance of a tutor for writing or ESL support. The Office of Student Services offers free one-on-one tutoring for all HU students. A student can choose to meet with a peer tutor in-person or on-line. In addition, HU also offers free access to tutoring services 24 hours a day, 7 days a week through Brainfuse. Access Brainfuse through any of your course pages on Canvas. Due to the rigors of an advanced degree, tutors are only able to provide writing support, not subject-specific assistance.

Student Concerns and Complaints

The Office of Student Services offers guidance to the student when uncertainty exists about the appropriate process to address a topic, concern, or problem. A request for assistance may be submitted to obtain clarification of a policy or procedure. The request is then reviewed and a recommended course of action is provided in a timely manner.

Health Services

Medical services are not provided on any campus location. Local medical facilities are listed on the Student Services SharePoint site at https://myharrisburgu.sharepoint.com/sites/StudentServices/SitePages/Resources.aspx

Mental Health Services

Counseling Center services include consultation, crisis intervention, workshops, support groups, connecting students to resources on and off campus, and providing information on mental health related topics. Free, confidential individual therapy is also available Monday-Friday on site at the Harrisburg campus, by appointment only. The Counseling Center

emphasizes a short-term counseling focus to help students reach their educational goals and work to remove barriers to this process. Counselors can also provide referrals to local or additional resources for students residing outside of the Harrisburg area, or in need of services outside the scope of the counseling center. For more information or to schedule an appointment, students may contact counseling@harrisburgu.edu or call 717-901-5100 ext. 1727 during business hours. Additional information and resources are also available online at the Counseling Center SharePoint site at https://myharrisburgu.sharepoint.com/sites/SSCounseling.

HU also provides 24/7 support for all students through a Student Assistance Program offered by BHS. BHS provides in-the-moment support for students in crisis or referrals for various services such as mental health care, medical care, legal advice, and food assistance. The BHS website also has a list of valuable resources at https://portal.bhsonline.com (Username: HarrisburgU) For more information, go to the Student Services SharePoint site at https://myharrisburgu.sharepoint.com/sites/SSCounseling/Sitepages/counseling.aspx or call the 24/7 BHS support line at 800-327-2251.

Accessibility Support Services

Harrisburg University of Science and Technology welcomes diversity among its students and, in accordance to the Americans with Disabilities Act of 1990, seeks to provide reasonable and effective support services. The Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act of 1973 prohibit discrimination on the basis of disability and require the University to make reasonable accommodations for those otherwise qualified individuals with a disability who request accommodations. The applicant must provide recent documentation from a medical provider (within 3 years) of any disability that may affect learning to ensure that appropriate accommodations are considered. Please reach out to ADA@harrisburgu.edu for questions regarding proper documentation as well as support services provided.

Textbook Services

A complete textbook listing is made available on BNC College (https://bncvirtual.com/harrisburgu) at the time of registration. Textbooks are made available for student purchase through the services of BNC College, which has an online store for new and used textbook purchase or rentals. Textbooks and other supplies (if specified for a course) must be obtained by the student prior to the first day of class.

Additional online textbook purchase and rental options are available through companies such as Amazon. Many book retailers carry a small selection of texts but also have the ability to process online textbooks orders.

University Library

The mission of the Harrisburg University Library is to support the mission of the University by enabling excellence in teaching and learning by providing robust access to information resources, integrating information literacy skills throughout the curriculum, and providing physical and virtual spaces for free intellectual curiosity, learning, collaboration, and knowledge sharing and creation. Library services include:

- collaboration between librarians and faculty to integrate information literacy skill development and use of information resources into the curriculum;
- access to a wide range of information sources selected to enhance course-based and independent learning, such as
    - online databases of articles from newspapers, magazines, and scholarly journals;
    - streaming media such as documentaries and video learning courses;
    - electronic books; and
    - a self-service library located in the Learning Commons offering physical-format books, games, and periodicals;
- research guidance for students by phone, e-mail, chat, or individual consultation;

- partnerships with other libraries to provide access to their information sources, free of charge to our students and faculty; and
- group study rooms which may be reserved in advance through a librarian.

For more information including reporting of lost or damaged items and replacement charges see the Student Handbook.

For more information, visit the library's website at http://library.harrisburgu.edu. Electronic content is available on the website 24 hours a day from on- or off-campus. Off-campus use requires authentication with valid University credentials.

Technology Services

Information Technology Services is responsible for connecting the student, faculty, and staff to technology resources in support of the University's mission. Technology services include:

- a robust and reliable infrastructure to enable excellence in learning;
- a required laptop program and an entirely wireless campus to facilitate mobile computing and access to content;
- high-end classroom technologies to enhance interactivity and the capture and distribution of classroom content;
- access to enterprise software applications such as our course management system;
- MyHU; Office365 email and productivity suite; and many other course-related software programs;
- the Harrisburg University Campus Card services which enables building access, pay-for-print, and book check-out from the library while serving primarily as the official university identification; and,
- training, orientation, and support for all university technology services.

For more information, contact the OISHelp Support Portal at ithelp.harrisburgu.edu or 717.901.5177 with questions.

Academic Advising

Academic advising can be a critical component of a student's education. Every graduate student is assigned to an academic advisor who is a faculty member. The advisor helps the student explore academic goals and assists in course selection for the academic program. The Office of Student Services supports the faculty role in advising. In addition, it assists the student to access resources and develop strategies when non-academic factors affect a student's ability to succeed.

Career Services

Career Services provides students with the opportunity to explore career fields and occupation. The following services can be obtained by enrolled students and alumni: one-on-one career counseling, assessment inventories, program and career exploration, professional development resources, mock interviews, and resume review. For more information, contact CareerServices@HarrisburgU.edu.

Academic Policies

Calendar, Credit System and Final Examinations

The University operates on a semester calendar and uses the semester hour credit system. There are two tracks of semesters per twelve-month period: (Fall, Spring, Summer) and (Late Fall, Late Spring, Late Summer). Students cannot cross over between the two tracks. Each semester consists of fourteen weeks of classes.

Credit Hour Policy Program Instructional Equivalencies

A wide variety of course delivery is utilized. "Learning hours" are assigned to each course. Each "learning hour" represents one hour per week of student engagement, including both instructional and outside of class activities. The University reserves the right to change the delivery method of a course due to administrative needs, the health and safety of the University community, or government mandates.

Traditional 14-week semesters are offered, plus subterms and an accelerated format. Regardless of the format or delivery, all programs whether online, blended/hybrid, executive weekend, accelerated, subterms or traditional classrooms, must meet the 126-learning hours requirement for a 3-credit course (3 credits * 3 hours/credit * 14 weeks = 126 hours). Adherence to these regulations enhances the quality and rigor of the academic programs and is achieved by utilizing the "instructional equivalencies" detailed below.

Faculty establish the learning-based interactions (when, where, how and why) including frequency, duration, evaluation, and assessment techniques. These guidelines recognize the need for the faculty to actively manage the learning space, both inside and outside the classroom. This policy is extremely important in helping faculty in the design and teaching of courses and in student learning. It is the responsibility of the faculty to deliver academic quality regardless of delivery format.

Provided below is an outline of acceptable "Instructional Equivalencies":

	Description	Rate of Equivalency
Blogs, Journals, Logs	Students' opportunity to apply learned concepts or for reflection on learning experiences; to be shared with instructor and/or classmates for thoughtful analysis, feedback and assessment.	1 private online posting= ½ learning hour 1 shared online posting (required to read all classmates' postings)= 1 learning hour
Case studies & problem solving scenarios	In-depth analysis requiring utilization of higher order analytical skills which relate to course objectives and is shared with instructor and/or classmates for feedback and assessment.	1 case study analysis & posting= 1-3 learning hour
Required Online Chat rooms for group projects	Instructor-led opportunities for collaborative, synchronous learning with specific expectations for participation & feedback. (Chats are posted for review.)	1 hour online chat= 1 learning hour
Conference calls	Instructor-led opportunities for collaborative, synchronous learning with specific expectations for participation & feedback. (When possible, calls to be recorded for review.)	½ hour call = ½ learning hour
Discussion Board	Instructor-guided or mediated threaded discussion that directly relates to course objectives and which has specified timeframes, expectations for participation, and thoughtful analysis.	1 posting (requires reading all postings) = ½ learning hour 1 posting (requires reading all postings and

		reply to a minimum of 2) = 1 learning hour
Field trips, tours and experiential learning (to include virtual tours)	Students participate as individuals or in groups in analyzing an activity & preparing a paper or presentation, to be shared in whole or in part with instructor and/or classmates.	(Instructor-Led)- 1- hour tour= 1 learning hour (Student(s) alone without instructor)- 1-hour tour plus reflection paper= 1 learning hour
Group projects	An instructor-mediated culminating activity with specific learning objectives; students collaborate via e-mail, chat rooms, discussion boards, wikis, and/or face-to-face contact to research, analyze, synthesize, & prepare project with instructor receiving periodic updates & providing guidance to group.	1 hour = 1 learning hour
Guided Project/Thesis	An instructor-mediated culminating individual project/thesis with specific learning objectives; student and instructor collaborate via email, chat, discussion boards, and/or face-to-face to research, analyze & prepare project/thesis with instructor receiving periodic updates and providing guidance and feedback.	1 hour = 1 learning hour
In-Class Instruction, Presentations, Tests	Instruction, presentations, and tests provided in person in live classroom setting.	1 hour = 1 learning hour
Instructional CDs, PowerPoints, Videos	Instructor-mediated to expand upon and clarify course concepts and objectives.	Reviews & posts response to 1 unit= 1 learning hour
Lecture activity-written or audio	Opportunity for students to develop questions, comments, or observations, to be shared with classmates & instructor through discussion board postings or participation in chat rooms.	Reviews 1 lecture & posts response= 1 learning hour
Library Research (instructor led)	In-depth instructor led opportunity for students to research scholarly articles or professional journals that relate to course objectives; to be shared with class in a designated manner.	Research for 1 five-page project = 1 learning hour Research for 1 3-5-page paper = 1-2 learning hours
Online Quizzes	Opportunity for instructor to assess students' subject knowledge and provide feedback on students' progress.	1-hour test = 1 learning hour
Reflection Paper or Article Review	Instructor-guided activity for students to apply learned concepts and relate practices to personal experiences or apply higher order analytic skills in assessing scholarly articles or professional journals.	1 private posting = ½ learning hour 1 shared posting (required to read all classmates' postings) - 1 learning hour
Service Learning Project; Jr and Sr projects, capstone	An instructor-led service project with specific learning objectives that integrates community service with academic study; faculty provides guidance, support, and feedback to students and students shares experience and reflection with fellow classmates via emails, chats, discussion boards, and/or face-to-face.	1 hour = 1 learning hour
Web-conferencing	Instructor-led desktop to desktop or classroom video streaming instruction for collaborative, synchronous learning with specific expectations for participation and feedback. (i.e., Canvas, Adobe Connect, Skype, etc.)	1 hour = 1 learning hour
Web-Quest (Internet Research)	Instructor-guided opportunity for students to research information on the Internet that enhances student learning and addresses	1 in-depth posting = 1 learning hour

	specific course outcomes; findings shared with the instructor and classmates.	

*Researching, PowerPoint/video reviews, WebQuest activities, reading articles, etc. are considered "homework" assignments. The Rate of Equivalency denoted pertains to posting, reviewing, sharing, and providing student-to-student and/or instructor-to-student feedback.

Adapted from Misericordia University, Dallas, PA and modified for Harrisburg University.

Catalog in Effect

A new student entering the University during the 2022-2023 academic year will be subject to the academic program requirements contained in this Catalog edition unless the student elects to complete a revised set of program/concentration requirements published in a future edition of the Catalog. The Master's student is expected to fulfill the academic requirements in 3 years from the date first enrolled in the program. The Doctorate student is expected to fulfill the academic requirements in 7.5 years from the date first enrolled in the program.

A student who elects to complete a revised set of program/concentration requirements must notify Records and Registration of this intent by completing a Change of Program form located on MyHU. A student that earned 24 credits or more toward their degree requirements cannot change degree programs/concentrations without approval from Records and Registration, in consultation with the faculty advisor justifying academic need.

A student who leaves the University and returns from an absence of one year or more will be subject to the Catalog edition in effect during the year of return.

Enrollment Status

The student is expected to maintain consecutive enrollment, which is defined for certification purposes as either full-time or part-time. Full- time student enrollment is 6 or more semester hours in a semester. Part-time student enrollment is fewer than 6 semester hours in a semester. A student is limited to 6 semester hours for the first semester of enrollment.

Consecutive enrollment is expected throughout the program; however, one semester break is permitted. F-1 students must meet their status eligibility requirements to take a break. If a student requests a second break due to extreme circumstances, program lead approval is required. Under normal circumstances, if more than one consecutive break is requested, the student would need to withdraw from the program and then reapply when ready to return. A student that does not return following a semester break will be unofficially withdrawn and will be required to reapply.

A non-degree student must make a decision to remain a non-degree student or become a degree-seeking student after the student has completed 12 semester hours of coursework.

Registration Process

All students complete registration on-line at MyHU/Academics. There are written and/or video registration instructions available on MyHU. The start and end dates appear on the Academic Calendar, which is posted on MyHU/Academics and www.HarrisburgU.edu. Students who require an Americans with Disability Act accommodation to complete registration should contact the Office of Student Services at ADA@HarrisburgU.edu.

Directed Studies

A student requesting a directed study for a course from this catalog must obtain a Directed Study Request form from Records and Registration. The student must provide a rationale for requesting the directed study before approval can be granted by Records and Registration. The following guidelines are required for a directed study:

1. Directed studies are open to students with 24 or more credits completed.
2. Directed studies must be necessary. Directed studies are deemed necessary if a student needs a specific course in their program in order to graduate that can only be met through a directed study.
3. A student must have a minimum GPA of 3.25 in order to request a directed study.
4. A student may not take more than 6 credits of independent study or directed study from one faculty member.
5. The program lead and the student's faculty advisor must agree to offer the directed study.

Add/Drop Period and Course Withdrawals

The Add/Drop Period begins on the first day of the semester or subterm and ends after 6 days of classes have occurred (this includes Saturday). A student may make schedule adjustments during the Add/Drop period on MyHU, or in the Records and Registration office. No course may be added after the end of this period. If a student withdraws from any course after the conclusion of this period and up until the last day to withdraw from a course with a "W", a final grade of "W" will appear on the permanent record. After that period, a "WF" will appear on the permanent record. The withdrawal deadlines appear on the Academic Calendar for both semesters and subterms.

Enrollment Status Determination

A student's enrollment status is determined at the end of the Add/Drop Period. The student is charged the applicable tuition rate for the number of semester hours in which the student is enrolled on the census date.

Audit Policy

The student may choose to participate in a course on an audit basis. The student who elects this option is expected to attend and participate in class regularly and complete all course requirements. The course being audited carries no academic credit but is recorded on the student's academic record and will receive a Pass (P) or No Pass (NP) grade at the conclusion of the course. The student wanting to audit a course must notify Records and Registration in writing no later than the end of the Add/Drop Period. The per semester hour tuition rate applies to audited courses. An audited course cannot be subsequently taken for credit.

Class Attendance

Attendance is a critical part of a student's education. The student is expected to attend all classes when scheduled and participate fully in the activities of each course. The instructor is responsible to set forth the attendance requirements in the syllabus.

If, in the judgment of the instructor, a student is absent from class or fails to complete the requested participatory assignments:

1. the instructor will notify the student of this determination;
2. the student will have one week to contact the instructor to address the situation;
3. if the student fails to do so, the instructor will notify Records and Registration to recommend the withdrawal of the student from the course.

Advanced Standing

A master-degree student may earn advanced standing at the University. A doctorate-degree student is not eligible for advanced standing. Advanced standing can be earned in one of three ways: transfer of credit from another institution, the awarding of credit for military training, or prior learning assessment. The parameters for doing so are:

- limit to twelve (12) credits of combination between six (6) graduate transfer credits and prior learning assessment (in any combination);

- limit to six (6) credits of transfer credits and/or prior learning assessment for the core (capstone courses not eligible); and
- limit to six (6) credits of transfer credits and/or prior learning assessment for electives.

Armed Services Training Programs - Under the following conditions, a student may receive academic credit for training programs completed while serving in the U. S. Armed Services: 1) the student must present a copy of the discharge notice (completed DD-214 form); 2) the veteran's military occupational specialty (MOS) designation must appear on the discharge; and, 3) the student's MOS is described in the American Council on Education's Educational Experiences in The Armed Services volumes 1-3 . Credit is awarded based upon the ACE recommendation and the closeness of the match between the training program and a University course.

American Council on Education (ACE) - HU works with ACE recommendations to provide services for adult learners. Within the ACE Center, the College Credits Recommendation Service (CREDIT), connects workplace learning with colleges and universities. CREDIT does this by helping adults get academic credit, whenever possible, for courses and examinations taken outside traditional channels.

Transfer Credit - Unofficial or student copies of transcripts may be used to initiate the transfer credit evaluation process. However, official final transcripts from the institution of origin are required before the transfer evaluation process can be finalized by Records and Registration and academic credit is posted to the student's permanent record. The following limitations apply:

- transfer credit is limited to six (6) semester hours from another graduate program;
- the credit must have been earned with final grades of "B" or higher;
- the credit must be reviewed by the student's program advisor and Records & Registration;
- the credit must have been earned no more than five (5) years prior to the student's initial enrollment date in Harrisburg University's program; and,
- a course completed for Continuing Education Units (CEUs) is not eligible for transfer credit consideration.

Domestic -Academic credit earned for graduate work completed for a minimum grade of "B" or higher will be awarded if: 1) the course is a reasonable substitute of a University course or 2) the course(s) is considered graduate level work worthy of elective credit in the student's program of study.

International - A World Education Services (WES) transcript evaluation, Educational Credential Evaluation (ECE), or AACRAO's Electronic Database for Global Education (EDGE) transcript evaluation is required. If the original evaluation received by Records and Registration from one of these evaluators deems the student's prior work to be at the graduate-level and the quality of the completed work is assessed to be at the "B" or higher level, credit is awarded for the courses that apply to the student's intended program of study at Harrisburg University as indicated above for domestic transfer credit. If the prior work was earned under an educational system that did not assign credit values, a semester hour value is assigned for each course being accepted. If the student completed courses which are evaluated to be at the graduate-level, but Harrisburg University has no comparable course(s), the student is granted elective credit unless all required elective credit hours have been satisfied.

Massive Open Online Courses (MOOC) - a massive open online course is an online course targeting large-scale interactive participation and is delivered via open access on the web. A MOOC that is successfully completed will be reviewed and considered for transfer credit.

Coursework at Other Institutions - A student may study at other institutions and transfer the credit to the student's record at Harrisburg University.

Process for Approval - The student must complete an Off-campus Coursework Form at Records and Registration notifying the University of the student's intention to enroll on a visiting basis at another higher educational institution. The request will be reviewed by Records and Registration who may consult with an appropriate member of the

University's faculty. Prior to enrollment, a written response will be sent to the student stating whether or not the proposed course is acceptable.

Process for Awarding of Credit - The student must arrange for an official transcript from the other college or university to be sent to Harrisburg University's Records and Registration office. If the approved course was completed with a final grade of "B" or higher, the semester hours earned from the course will be posted to the student's record at the University.

Prior Learning Assessment - The University may award graduate academic credit for prior knowledge, skills and abilities acquired through non-accredited and work-related learning experience equivalent to:

- the outcomes of a specific course; and,
- the outcomes of graduate-level work not currently offered at the University.

The experience and evidence provided should have a direct relation to the material taught in a course in the University's curriculum and should extend over a sufficient period to provide substantive knowledge in the relevant area. A Master of Science degree-seeking student who is in good academic standing, has completed a minimum of 6 semester hours in a program of study at Harrisburg University and demonstrates the qualities to receive such credit may petition the Provost through the academic advisor for consideration of prior learning assessment.

The petition must include the following:

- a detailed description of the relevant experience;
- appropriate supporting evidence directly linked to course objectives;
- the equivalent University program, course number, and title; and,
- the number of semester hours sought.

A student may not receive more than 6 semester hours related to the program based upon prior learning assessment.

The prior learning assessment process is a way to demonstrate to a mentor, who is an expert in the field, graduate-level knowledge in a particular course area. These skills and knowledge may be from applicable work experience, volunteer activities, training programs, hobbies, religious activities, homemaking skills, prior independent reading or special accomplishments. This process is not independent study.

Working with a mentor, the student is guided to develop an online, electronic portfolio to demonstrate prior graduate-level learning. The student can choose between standard prior learning assessment and individualized prior learning assessment. Standard prior learning assessment is an option when existing course descriptions and learning objectives match the learning that the student wants to demonstrate. Individualized prior learning assessment occurs when the student proposes a course description and learning objectives that do not currently exist in the course catalog for Harrisburg University.

Prior learning assessment cannot be awarded for physical education courses, field experiences, student teaching, cooperative education, practicum courses, internships, projects, seminars, independent study or laboratories. It is important for the student to understand that life and learning experiences alone are an inadequate basis for the award of prior learning credit. To be eligible for prior learning assessment, the outcomes of the non-collegiate learning experience must be documented, be applicable to the student's program of study, be directly related to a course's learning objectives, and be assessed as being similar to or meeting the requirements of learning gained through college-level learning experiences.

Approval of prior learning credit must be made in writing from the academic advisor, the appropriate faculty member, and the Provost. Capstone credits are not eligible for prior learning assessment. A per semester hour charge is incurred by the student for the number of semester hours sought under prior learning assessment.

For more information about prior learning assessment, contact Records and Registration.

Alternative Work Study/Fieldwork for Masters Degree Program

MS programs at HU are designed for working professionals focused on career advancement who can apply what is learned back to their workplace. In HU's MS programs, the expectation is that degree candidates are working professionals. Therefore, spanning the degree program, each course has multiple applied projects and work-related assignments leading up to a capstone practicum.

Alternative Work Study for International Students on F1 Visas

To fulfill the integration of professional work experience into all phases of the MS degree program, students studying on an F1 visa must request to be approved for CPT, Curricular Practical Training. CPT is defined by the federal government as an alternative work-study, internship, cooperative education employment, or other type of internship or practicum that is an integral part of an established curriculum. Since professional work experience is an assumed integral component tied to each of the Master of Science degree programs offered at Harrisburg University, non-immigrant students on a valid F1 visa and otherwise maintaining status may be authorized to accept internships and work placements via CPT to position themselves for the same academic success enjoyed by their non-regulated counterparts in the classroom.

An F1 student must be authorized by one of HU's Designated School Officials (DSO) *prior* to accepting and beginning an alternative work study. For more information on how to apply and when to apply, students should contact the International Student Office (ISO). Students are cautioned to take note: There are SEVP regulations related to off campus employment and training experiences. Failure to maintain status will jeopardize F1 standing and will result in revocation of the I-20. HU's DSOs can point students to resources to help them meet goals without jeopardizing F1 status.

A student's CPT internship experience or employment must relate to the program of study and may be part-time (20 or fewer hours per week) or full-time (21 or more hours per week). HU allows the period of eligible CPT employment to be extended through the short breaks between semesters if the student is pre-registered for the immediate next semester of enrollment. HU limits CPT employment to no more than 40 hours per week and expects academics to be prioritized. CPT may not continue through semester-long breaks.

Applied Studies for International Students on F1 Visa - Doctorate Degree Program

The doctorate program at Harrisburg University includes learning components (coursework, seminars, research), and may include fieldwork that can contribute to the student's knowledge in the program of study.

Ph.D. programs at HU recognize the crucial connection between industry/business and research/ development. Scholarly research in the STEM fields cannot be disconnected from those practitioners innovating in their fields. Therefore, Ph.D. students who are practitioners in their field are highly sought at HU. The expectation is that the active synergy between research and practice in applied studies will go far in solving the worlds challenges through the STEM disciplines.

In order to remove limits and borders for recruiting professional practitioners into the HU PhD programs, HU will approve Curricular Practical Training (CPT) for F1 students who are able to integrate professional experience into the learning environment of their PhD program, meeting the expectation of applied studies during the coursework phase of the program.

With the required approval of the university and benefitted industry parties, doctoral candidates at HU are able to develop their own individual study/research plan with faculty advisors on topics of their choice. Candidates may choose where they would like to conduct their research at

- Harrisburg University laboratory or at a partnering research institutional laboratory

- A non-academic research center/organization or industry/workplace (which requires approval of industry partners)

Applied Studies for International Students on F1 Visas

If applied studies or employment-based research are an integral component of a chosen Doctorate degree program, non-immigrant students on a valid F1 visa and otherwise maintaining status may be authorized for periods of Curricular Practical Training (CPT). CPT is defined by the federal government as an alternative work-study, internship, cooperative education employment, or other type of internship or practicum that is an integral part of an established curriculum.

An F1 student must be authorized by one of HU's Designated School Officials (DSO) *prior* to accepting and beginning a professional field placement. For more information on how to apply and when to apply, students should contact the International Student Office (ISO). Students are cautioned to take note: There are SEVP regulations related to off campus employment and training experiences. Failure to maintain status will jeopardize F1 standing and will result in revocation of the I-20. HU's DSOs can point students to resources to help them meet goals without jeopardizing F1 status.

A student's CPT internship experience or employment must relate to the program of study and may be part-time (20 or fewer hours per week) or full-time (21-40 hours per week). HU allows the period of eligible CPT employment to be extended through the short breaks between semesters if the student is pre-registered for the immediate next semester of enrollment *and* the next immediate semester includes a period of continued required field experience. HU limits CPT employment to no more than 40 hours per week and expects academics to be prioritized. CPT may not continue through semester-long breaks.

A doctoral student who completes all coursework and enters the thesis/dissertation phase of the program may be considered for CPT if the work experience is clearly documented as necessary for the completion of the thesis or dissertation.

Overview of the Masters Degree Program

Graduate Education focuses on individualized career advancement in areas of study within the science, technology, engineering, and mathematics disciplines. The University's approach is based on an experiential model that allows the student to gain and apply knowledge and skills at an advanced level and to focus on an area of need or interest particular to the student. Faculty combine corporate and academic perspectives in the design, development, and delivery of graduate programs and courses. Programs are designed for working professionals focused on career advancement who can apply what is learned back to their workplace. Therefore, each course has multiple applied projects, work-related assignments, and each degree has a practicum requirement of all students.

Harrisburg University's graduate programs are based on the following model:

- All M.S. degrees are granted for 36 semester hours (12 courses) of graduate work.
- Each MS program has 5 or 6 required courses that uniquely define the specific graduate program.
- There are a variety of graduate-level courses that the students in any M.S. program may take as electives. This pool of electives may consist of a wide range of courses from different graduate-level programs.
- There is a 6-credit capstone/applied project/practicum or thesis requirement for all graduate degrees at the University. This practicum synthesizes the key concepts of the program and extends/applies these concepts to real-life practical problems or research investigations. The capstone consists of two courses: a research methodology and writing course, and a Graduate Thesis or Applied Project or a Practicum required of specific programs. The courses leading up to this practicum experience combined with the practical work experience for students are required to complete the applied project. Students authorized by the University for CPT must take the applied project option within their specific degree program.

Overview of the Doctorate Degree Program

The doctoral program offers a course of study that emphasizes a strong foundation in science, technology, engineering, and mathematics disciplines. Doctoral candidates are required to complete six doctoral-level courses (18 semester hours); 6 semester hours in a formal research seminar; and 12 semester hours of dissertation work (research studies). A student cannot take a break after starting the research studies portion of the program unless there are extenuating circumstances.

After completing 18 semester hours of doctoral-level courses, the student is eligible to sit for the qualifying examination. The qualifying examination is designed and administered by the candidate's dissertation committee. The examination is comprised of both oral and written requirements including the committee's approval of the candidate's dissertation proposal.

A doctoral candidate may form a partnership with another institution in order to utilize that institution's facilities for research and project development, enlist doctoral faculty from another institution as dissertation or project committee members, or take appropriate post-master's courses from that institution.

Graduation Requirements for Masters Degree Program

A student must satisfy all of the following requirements to receive a Master of Science degree. Verification that the student has met the following requirements is made by Records and Registration.

1. At least 36 semester hours must be successfully completed.
2. A minimum cumulative grade point average of 3.00 is required for graduation from a Master of Science program and graduate advanced study programs.
3. In order for any completed course to satisfy the 36 semester hours required, the course must be completed with a grade of "C" (2.00) or higher.
4. A student must earn a minimum of 30 semester hours in residence toward a Master of Science degree from the University. The number of semester hours that may be transferred from another institution's graduate program is six semester hours.
5. A degree student will demonstrate proficiencies in the field of study and the University's competencies through use of an ePortfolio or a similar technology or evidence-based approach.
6. A student must complete all requirements for the Master of Science degree within 6 years from the first day of attendance as a degree-seeking graduate student.

A candidate should apply for graduation after registering for the last semester of the anticipated completion date by submitting an Application for Graduation via MyHU. Once degree requirements are met, the degree will be conferred.

A candidate for graduation must complete all requirements for the degree to be eligible to participate in Commencement. There is a Commencement cost of approximately $70 for the graduate student.

Graduation Requirements for Doctorate Degree Program

The student must satisfy all of the following requirements to receive a PhD degree. Verification the student has met the following requirements is made by Records and Registration.

1. At least 36 semester hours must be successfully completed.
2. A minimum cumulative grade point average of 3.00 is required for graduation.
3. In order for any completed course to satisfy the 36 semester hours required, the course must be completed with a grade of "B" (3.00) or higher.
4. Candidates will schedule their dissertation defenses after receiving approval from the dissertation committee chair (or co-chairs).

5. Candidates must submit (but not yet have published) the results of their dissertation or project work for publication in a refereed journal and/or complete a patent application prior to the conferral of a degree.

Requirements for Earning a Second Masters Degree

A person who has earned a master's degree from HU or another accredited college or university may earn a second master's degree by meeting the following requirements:

1. A student may not pursue a second degree under the same program of study (e.g., if a student already has earned a M.S. in Learning Technologies, the student cannot pursue a second M.S. in Learning Technologies). If the second program requires more than three course waivers (or two transfer courses and one waiver), the student will need to select a different program.
2. The student must satisfactorily meet all graduation requirements for the second-degree program.
3. A minimum of 30 additional graduate course semester hours within the second degree's program must be successfully completed at HU.
4. No course already successfully taken in the first-degree program may be repeated in the second degree.
5. Six credits may be transferred from the first master's degree to fulfill graduation requirements for the second master's degree. These will not count toward the 30-semester hour residency minimum.

The Request for Second Masters Degree Form must be completed and submitted to Records and Registration at least two weeks before the start of the semester.

Grades and Grading

Grades are awarded to each student for academic credit completed at the University. A grade is assigned by the instructor responsible for the course in which the student is enrolled, using the following grading scale to indicate the quality of the student's academic work.

Masters Degree Grading Scale:

Grade	Description	Numerical Value
A	Superior achievement	4.00
B	Average achievement	3.00
C	Minimum achievement	2.00
F	Fail	0.00
FD	Fail - Disciplinary	0.00
AU	Audit	Not applicable
CR	Credit	Not applicable
I	Incomplete	Not applicable
IP	In progress	Not applicable
LB	Laboratory	Not applicable
NP	No Pass	Not applicable
NR	Not reported	Not applicable
P	Pass	Not applicable
PLA	Prior Learning Assessment	Not applicable
TR	Transfer credit	Not applicable
TA	Transferred credit earned with superior achievement	Not applicable
TA-		Not applicable
TB+	Transferred credit earned with above-average achievement	Not applicable

TB		Not applicable
TP	Transfer Pass	Not applicable
TS	Transfer Satisfactory	Not applicable
W	Withdrawal	Not applicable
WA	Administrative withdrawal	Not applicable
WF	Withdrawal after the period to withdraw with a "W" grade	0.00

Doctorate Degree Grading Scale:

Grade	Description	Numerical Value
A	Superior achievement	4.00
B	Average achievement	3.00
F	Fail	0.00
FD	Fail - Disciplinary	0.00
AU	Audit	Not applicable
CD	Doctoral Studies Complete	Not applicable
CR	Credit	Not applicable
CX	Doctoral Studies Continued	Not applicable
I	Incomplete	Not applicable
IP	In progress	Not applicable
NP	No Pass	Not applicable
NR	Not reported	Not applicable
P	Pass	Not applicable
TR	Transfer credit	Not applicable
TA	Transferred credit earned with superior achievement	Not applicable
TB	Transferred credit earned with above-average achievement	Not applicable
TP	Transfer Pass	Not applicable
TS	Transfer Satisfactory	Not applicable
W	Withdrawal	Not applicable
WA	Administrative withdrawal	Not applicable
WF	Withdrawal after the period to withdraw with a "W" grade	0.00

Grade Definitions

Grades of "AU", "CD", "CR", "CX", "I", "IP", "LB", "NP", "NR", "P", "PLA", "TR", "TA", "TA-", "TB+", "TB", "TP", "TS", "W", or "WA" are not included in the calculation of a student's grade point average (GPA). These grades are used by the University in circumstances when grades of "A" through "F" are not appropriate. "WF" and "FD" grades are calculated into the student's GPA.

Audit (AU) - The audit grade is assigned by the instructor when the student has properly registered to audit the course and has met all requirements of the University's course audit policy.

Doctoral Studies Complete (CD) - A grade of "CD" is used to indicate doctoral studies are complete.

Credit (CR) - A grade of "CR" is used to indicate on the student's permanent record that credit has been awarded by the University for military training or successful completion of an examination. While courses with a "CR" grade are counted toward the student's degree requirements, there are no quality points associated with this grade so there is no impact upon the calculation of the student's grade point average.

Doctoral Studies Continued (CX) - A grade of "CX" is used to indicate the doctoral studies are in progress.

Incomplete (I) - Inability to complete coursework due to documented circumstances beyond the student's control (such as severe illness) may, at the discretion of the instructor, result in a temporary grade of incomplete (I). It is the responsibility of the student to work with the instructor to complete the Incomplete Grade Agreement Form and submit the completed and signed form to Records and Registration. Students are required to make up all the outstanding course material as negotiated per the Incomplete Grade Agreement. However, all work must be completed by the end of the Add/Drop Period of the subsequent semester. If all work is not completed by that time, the "I" grade will convert to a grade of "F". Extensions may be granted by the Instructor with approval from Records and Registration.

In Progress (IP) - This is a deferred grade assigned by the instructor to be used for research projects, internships, independent study, directed study, etc., when it is understood that the course will extend over more than one semester. An "IP" grade should be accompanied by a written plan and a schedule for completing the course within a specified time period to be no longer than 12 months. If all work is not completed by that time, the "IP" grade will convert automatically to a grade of "F".

Laboratory (LB) - This grade is assigned by Records and Registration at the conclusion of a semester to a student who is enrolled in a non-credit developmental recitation section of a course. This grade and such a course do not appear on the student's transcript.

No Pass (NP) - The "NP" grade is assigned by the instructors for a student who does not successfully complete a course that is designated as a course that will be graded on a Pass/No Pass basis.

Not Reported (NR) - The temporary grade of "NR" is recorded by Records and Registration when the instructor does not report a grade for the student for the course. Records and Registration will advise the Provost when an "NR" grade has been recorded for the student and will work with the student and the instructor to determine why a grade was not reported.

Pass (P) - The "P" grade is assigned by instructors for a student who successfully completes a course that is designated as a course that will be graded on a Pass/No Pass basis. A "P" grade indicates a grade of C or higher.

Prior Learning Assessment (PLA) - The "PLA" grade is used to indicate credit that has been awarded by the University for prior learning. Although a course completed with a "PLA" grade is applied toward the student's degree requirements, no quality points are associated with this grade so there is no impact upon the calculation of the student's grade point average.

Transfer (TR) - A grade of "TR" is used to indicate on the student's transcript a block of credit that has been earned at another institution and that will count toward the degree at Harrisburg University.

Transfer with Grade Notation (Txx) - A grade of "Txx" is used to indicate on the student's transcript each course that has been successfully completed at another institution and that has been accepted toward the degree at Harrisburg University.

Withdrawal (W) - This grade is recorded by Records and Registration when the student has withdrawn from the course according to the policy set forth by the University for withdrawing from a course.

Administrative Withdrawal (WA) - The "WA" grade can be assigned only by the Provost or other designated official. It is used under extenuating circumstances and when the normal withdrawal process is not available to the student. A request for administrative withdrawal with accompanying documentation will be submitted to Records and Registration. The "WA" grade can be submitted at any time during the semester.

Withdrawal Fail (WF) - This grade is recorded by Records and Registration when the student has withdrawn from the course after the period a student can withdraw with a "W" grade.

Fail - Disciplinary (FD) - The "FD" grade can be assigned only by the Provost or other designated official. This grade is used when a student earns a failing grade due to academic dishonesty. A request for the FD grade with accompanying documentation will be submitted to Records and Registration, at which point the student will be withdrawn from the course. This grade can be submitted at any time during the semester.

Grade Point Averages

A grade point average (GPA) is a statistical calculation of a student's performance in a semester. The semester grade point average summarizes the student's performance during that academic term and the cumulative grade point average (CGPA) summarizes the student's performance during semesters completed at the University.

Calculation of the Semester Grade Point Average				
Course	Sem. Hrs. Attempted	Grade	Numerical Value	Quality Points
Course A	3	A	4.00	12.00
Course B	3	B	3.00	9.00
Total	6			21.00
Total Quality Points = 21/6 = 3.5				

1. Compute the quality points earned for each course by multiplying the semester hours attempted for the course by the numerical value of the grade earned in the course. *Example: A student registered for a course worth 3 semester hours who earns a final grade of "A" in that course will earn 12 quality points for that course (3 semester hours x 4.0).*
2. Add the quality points earned for each course in which the student is registered in the semester.
3. Add the number of semester hours attempted for all courses in which a grade of "A" through "F" was earned.
4. Divide the total number of quality points earned by the total number of semester hours attempted. The result is the grade point average for the semester.

The cumulative grade point average (CGPA) is determined in a similar way using the cumulative attempted semester hours and cumulative quality points earned.GPA and CGPA are truncated to the hundredths.

Incomplete Grade

A grade of Incomplete (I) is a discretionary decision. The guidelines for incomplete grades are:

- The Incomplete Grade may be assigned if the student's work is of non-failing quality and there is a reasonable likelihood that the student will complete the course material.
- The student must have extenuating circumstances such as an illness, accident, serious personal problems, etc.
- The student and faculty should work together to complete and sign the Incomplete Grade Agreement and then submit the completed form to Records and Registration.
- The Incomplete Grade Agreement must include the reason for the Incomplete grade, the outstanding work, and the submission deadlines.
- The deadline in the agreement is up to the discretion of the instructor but should be prior to the end of the add/drop period of the subsequent semester.
- Instructors must obtain approval for any extensions from Records and Registration.
- Once the outstanding work has been submitted Faculty must submit a Change of Grade Form to Records and Registration for the grade to be updated.
- If the outstanding work is not submitted by the end of the add/drop period of the subsequent semester, the Instructor should submit a Change of Grade Form so that the grade is changed from the I grade to the grade earned in the course.

- If the Instructor fails to submit the change of grade form two weeks after the end of the add/drop period of the subsequent semester, Records and Registration will update the Final grade to an F.

Repeated Courses for Masters Degree Program

A masters student may repeat a course in which a final grade of "C" or below, "W", "WA", or "WF" has been received. The original grade will remain on the student's academic record. After the course has been repeated, the most recent grade will be used in the calculation of the student's cumulative grade point average. A student cannot repeat a course for the sole purpose of improving the overall GPA if the degree requirement has already been met.

Repeated Courses for Doctorate Degree Program

A doctorate student may repeat a course in which a final grade of "W", "WA", or "WF" has been received. They can only attempt to repeat it one time. The original grade will remain on the student's academic record. After the course has been repeated, the most recent grade will be used in the calculation of the student's cumulative grade point average. The expectation is a student will be successful. If an unsuccessful grade is earned, a student receiving a failing grade will have their academic record and progress reviewed by the Academic Standing Committee and program lead.

Academic Standing Policy

A graduate student with a cumulative grade point average (CPGA) of 3.00 or higher is in satisfactory academic standing. A student whose CGPA falls below 3.00 is not in satisfactory academic standing and will be placed on academic probation. A student who fails to make satisfactory academic progress at the end of a semester is subject to warning, probation, or dismissal according to the following policy:

First Occurrence - Warning
Following the first semester in which the student does not meet the satisfactory academic progress standard, the student will automatically be placed on academic warning for the next semester. A letter will be issued advising the student of their academic warning status. No appeal is needed, but in consultation with the Office of Student Services, an academic plan may be required.

Second Consecutive Occurrence - Probation
If, by the end of the warning semester, the student is not able to achieve satisfactory academic progress status, a letter will be issued placing the student on academic probation status for the next semester. The student should work with the Office of Student Services to determine an academic plan to improve the student's CGPA.

Third Consecutive Occurrence - Dismissal
If a student after three consecutive semesters has a CGPA that remains below 3.00 or fails to meet the program pursuit percentage, a letter of dismissal will be issued.

Appeals - A student who is dismissed as a result of failure to meet satisfactory academic progress, may file an academic appeal by submitting a letter outlining the nature of the appeal to the Office of Student Services within five (5) days from notification of dismissal. An appeal will be considered only if the student's failure to meet the standards of academic progress is determined to be due to events beyond the student's control. Examples of circumstances for which an appeal may be considered include military obligation; the death of a relative; injury or illness of the student; unusual personal hardship or other extenuating circumstances. Written documentation of the circumstances of why the student failed to make satisfactory progress and what has changed that will allow the student to make satisfactory progress by the next evaluation must be submitted with the appeal and should reference the student's name and student ID number. In addition, the evidence must be received documenting that the cumulative grade point average has improved, and the required satisfactory progress grade point average can potentially be achieved to complete a program of study within the maximum timeframe limitation. Appeals submitted without documentation will not be considered. A timely determination will then be made and documented in the student's file.

If the academic appeal is denied, a second notice will be sent to the student advising that their appeal was denied. If the academic appeal is approved, a semester of academic probation will be awarded, and the student will be notified in writing that their appeal was approved. The student must achieve satisfactory academic progress by the end of the probation semester.

If after the academic probation semester a student is still not making satisfactory academic progress, but the evidence is provided showing academic improvement, the cumulative grade point average has improved, and the required satisfactory academic progress grade point average can potentially be achieved within the maximum time frame limitation required by federal regulations then a second probation semester may be granted.

Final Grade Appeal

A final grade is assigned by the instructor upon completion of coursework to earn credit during a semester or other term. A student who disagrees with the final grade assigned by the instructor should first contact the faculty member directly to resolve the situation informally. Students that cannot approach the faculty member because of perceived discrimination, cannot reach the faculty member, or has received a response with which the student still disagrees may seek remedy using an evidence-based argument, with any supplemental documentation, within five (5) days after grades are posted on one of the following grounds:

1. Discrimination: defined as unfair treatment or assignment of grade on the basis of race, religion, national origin, sex, age, ancestry, handicapped status, gender identity, sexual orientation, or political affiliation.
2. Capricious evaluation: defined as a significant or unjustified departure from grading procedures outlined in the course syllabus or by the University or arbitrary assignment of grades. Capricious evaluation cannot be claimed if a student merely disagrees with the subjective evaluation of the instructor.
3. Errors: including clerical errors or errors in grade calculations that can be demonstrated in an objective manner.

A student who chooses to appeal a grade must contact the Office of Student Services to obtain a Final Grade Appeal Form. The form must be completed with an explanation forming the basis of the appeal and returned to Records and Registration. The student's academic record will be placed in a "hold" status during the grade appeal process. A final grade appeal must be initiated on or before the fifth (5th) business day after grades are posted or another term as specified in the Academic Calendar.

The instructor must indicate and sign the form to either change the final grade, reaffirm the original grade assigned, or continue with the appeal process within five (5) days of receiving the grade appeal form.

- If the original final grade is improved and satisfies the student's appeal, the instructor shall submit a Grade Change Form to Records and Registration, the grade will be posted, and the academic record hold status will be released.
- If the original final grade is reaffirmed and both the instructor and student agree with the grade determination, the instructor shall submit a Grade Affirmation Form signed by the student and instructor confirming the original grade to Records and Registration, the grade will be posted, and the academic record hold status will be released.
- When a student is unable to meet with the instructor because of personal differences or if the instructor denies the initial appeal (above), the student may choose to pursue a final grade appeal by submitting the completed and endorsed form, with any and all tests, grades, essays or project summaries, and a complete explanation as evidence in support of the student's position, to the Office of Student Services requesting a review and determination, with a copy to the Office of the Provost. The student may seek the assistance of the Office of Student Services to review a possible appeal and to prepare the appeal. Additional information may be requested from the student and/or the instructor during this time.
- A committee consisting of a representative of the Office of Student Services, Office of Compliance, one faculty member, and a student representative will review the appeal. The student and instructor will be offered the opportunity to participate in the appeal hearing. The committee will send a final determination to

Records and Registration within five (5) days of receipt. The committee's decision is final and is not subject to further appeal. Records and Registration will then post the grade and release the academic record hold status.

- If a student would like to appeal a grade during the semester, the student should approach the faculty member to resolve informally. All documentation should be saved. If at the time the final grade is insufficient, the student can file a formal appeal at that time.

Withholding of Records

Student records may be withheld by Records and Registration when directed by the appropriate University officials. The ability to register for courses or the release of academic transcripts or diplomas may be held for a period of time. More specifically, an official academic transcript or diploma will not be released, and a student cannot register for courses if tuition or other charges remain unpaid to the University. Additionally, a student cannot register for courses while the hold is on their record. The Office of Student Services determines when a student's record should be placed on hold for disciplinary reasons and the Business Office determines when a student's record should be placed on hold for financial reasons.

Official Withdrawal from the University Procedure

A student is encouraged to contact the Financial Aid and Business Offices in advance of any decision to withdraw from the University to obtain an explanation of the tuition and financial aid adjustments that will occur, if any, as the result of withdrawal from the program of study.

A student on an F-1 Visa should contact the International Student Office prior to submitting a withdrawal form to understand the impact it may have on their SEVIS status.

A student who intends to officially withdraw is encouraged to complete the Withdrawal Form via MyHU. Should a student have any questions, please contact Records and Registration by telephone (717.901.5136), RegHelp Student Portal at reghelp.harrisburgu.edu/, or in person.

The determination date for withdrawal purposes shall be the actual date of formal notification by the student. The determination date is used to calculate the tuition refund, if any, and the student financial assistance program refund, if applicable. Withdrawn courses cannot be reinstated.

Military Personnel Called to Active Duty Policy

If a student is called to active duty by the National Guard or the reserve forces of the United States during an active semester, they should provide documentation of their call to active duty to the Certifying Official. The below procedure will then apply:

1. Course Registration/Grades: The student will be given an option to have courses dropped or an "I" (Incomplete) grade assigned to each of their courses. The assigning of an "Incomplete" is by mutual consent of the faculty member and the student and an appropriate completion date is to be assigned. If the active duty call occurs late in the term, the faculty member also has the option of assigning a final grade rather than the "I" grade.
2. Tuition: Tuition charges will be canceled or refunded-in full- for all courses dropped. Courses in which the grade of "I" or a final grade is assigned will have applicable tuition assessed. The student must coordinate with the Certifying Official to address any overpayment or other financial considerations with Veterans Administration funding
3. Housing: If the student resides in campus housing, they should initiate a discussion with Residence Life Staff.

4. Student Record: The Student record will be kept active for one year from the later of the following dates, after which the student would be eligible for re-admission: - Effective date of the dropped course(s) - End of the final completed semester - Latest deadline of assigned "I" grade

Medical Withdrawal

A student requesting to withdraw for medical reasons must complete a medical leave request through the Office of Student Services by contacting StudentServices@HarrisburgU.edu or 717.901.5102. Student services will obtain official documentation from a doctor supporting the student's request. To return from medical leave, the student must provide student services with documentation from a doctor supporting the student's return. The student will have up to a year to return without having to apply for readmission.

Unofficial Withdrawal

A student who discontinues attendance in all courses during a semester and who does not officially withdraw from the University is considered to have unofficially withdrawn. The determination date for unofficial withdrawals shall be the end of the semester, unless other evidence is provided to Records and Registration. There are serious Title IV, H&A federal student financial aid program implications for a student who unofficially withdraws.

Standards of Academic Integrity

Harrisburg University expects a student to act honorably and in accordance with the standards of academic integrity. Academic integrity is grounded in mutual trust and respect. Therefore, it is expected that a student will respect the rights of others and will only submit work that is their own, refraining from all forms of lying, cheating, and plagiarism.

Disciplinary/Academic Dismissal

The University reserves the right to expel or suspend at any time a student who has misrepresented any part of their admission materials, whose academic record is unsatisfactory, or whose behavior or conduct is found to be detrimental to the orderly functioning of the University. When misconduct may constitute a threat to person or property within the University community or under other circumstances, it may result in disciplinary review action. The University assumes the responsibility to regulate the private conduct of the student when such conduct could constitute a hazard to or an infringement on the rights of others, a violation of the law, of University policy or instructions, or is a disruption of the legitimate academic and administrative processes of the University. Please see the Student Handbook for details on the policies regarding the Code of Conduct, Academic Code of Conduct, or Sexual Misconduct Policies.

Curriculum Overview

Learning at Harrisburg University

The goal of learning at Harrisburg University is to obtain the relevant knowledge, competence, and experiences to best be prepared for an enriching career. Learning is, therefore, a multi-faceted activity that occurs throughout and across the college experience; it integrates both academic learning (acquiring and applying new knowledge) and student development (learning about one's self). Competency-based learning outcomes with programs that are intentionally designed to be engaging, integrative, and experiential are emphasized. There are four inter-dependent program characteristics that help define the Harrisburg University experience:

- Highly Available: The University provides learning experiences to meet the student's needs. This is demonstrated, for example, through the use of technology inside and outside of the classroom, and the applied learning opportunities available.
- Highly Collaborative: The student develops knowledge and skills through shared experience, as opposed to learning in isolation or in competition with each other. The faculty is responsible for creating learning environments based upon the premise that knowledge can be gained from everyone. The student has the advantage of learning from the minds and experiences of classmates, business mentors, or employers.
- Highly Experiential: The University deliberately ensures that learning is highly-linked to both practical and professional experience. This represents a shift from one-way (faculty to student), text-heavy content delivery to a more robust learning model that deliberately values experience, both inside and outside the classroom.
- Highly Applied: The learning conversation focuses on the practical application of knowledge. The intention is to shift the question from "How do I remember this information?" to "How can I act on this information in order to create knowledge that is both useful and actionable?" In this way, learning becomes an exercise in both preparation for career and personal advancement.

Learning Assessment at Harrisburg University

Harrisburg University's model for the assessment of student learning is structured to support learning goals. The goals of the programs and courses are clearly defined and are relevant to the mission of the University. Course syllabi establish specific learning objectives, articulate the instructor's expectation of the student, and outline the standards against which the student's learning is measured. Learning assessment of coursework and experiential learning is creative, in that it goes beyond instructor-driven evaluation through examinations and papers in most cases and is done both inside and outside the classroom by faculty, business and academic professionals. Further, student learning around each of the University competencies is a focus of assessment activities. The University is committed to improve its program offerings by comparing student assessment outcomes to the program and course goals.

Competencies

Competency-Driven and Across-the-Curricula: A hallmark of the Harrisburg University experience is competency-driven education. The student will be expected to demonstrate mastery of eight university-wide competencies:

CIVIC ENGAGEMENT

Definition: Civic engagement is "working to make a difference in the civic life of our communities and developing the combination of knowledge, skills, values and motivation to make that difference. It means promoting the quality of life in a community through both political and non-political processes." (Excerpted from Civic Responsibility and Higher Education, edited by Thomas Ehrlich, published by Oryx Press, 2000, Preface, page vi.). In addition, civic engagement is participation in personal and public activities that are both life-enriching and socially beneficial to the community.

WRITTEN AND ORAL COMMUNICATION

Definition: Written communication is the development and expression of ideas in writing. It involves writing in a variety of styles, genres, and technologies and mixing text, data, and images. Written communication abilities develop through repeated writing experiences across the disciplines.

CRITICAL THINKING

Definition: Critical thinking is the use of deliberative thought, characterized by the comprehensive exploration of topics, ideas, artifacts, or events before accepting or formulating an opinion or conclusion. Using reason and experience to form informed judgments, the critical thinker combines or synthesizes existing ideas, images, or expertise in original ways; and reacts to experience in imaginative ways, characterized by innovation, divergent thinking, and risk-taking. The critical thinker solves problems by designing, evaluating, and implementing a strategy to answer an open-ended question or achieve a desired goal. Quantitative Literacy (QL) - also known as Numeracy or Quantitative Reasoning (QR) - is a "habit of mind," competency, and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations. They understand and can create sophisticated arguments supported by quantitative evidence and they can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc., as appropriate).

ENTREPRENEURSHIP

Definition: Entrepreneurship is the process of organizing tangible and intangible resources in order to pursue opportunities that generate value, meet an identified need, or satisfy an organizational or societal market (such as the creation of a business, organization, or laboratory). At Harrisburg University, entrepreneurship represents a "frame of mind" demonstrated by both thinking and action.

ETHICAL AWARENESS AND REASONING

Definition: Ethical decision making actualizes the realization and inclusion of the moral dimension for personal decision-making. "Reasoning about right and wrong human conduct requires students to be able to 1) assess their own ethical values and the social context of problems, 2) recognize ethical issues in a variety of settings, 3) think about how different ethical perspectives might be applied to ethical dilemmas, and 4) consider the ramifications of alternative actions." Ethical self-identity evolves both on individual and organizational (e.g., corporate) levels.

* Source: AAC&U / VALUE rubric

GLOBAL AWARENESS

Definition: Global awareness is knowledge of the world citizenry's common interests in community, social, political, information, and financial systems of different scales; appreciation and respect for diversity, culture, and environment; and the interactions and impacts of individuals, global systems, and cultures.

INFORMATION LITERACY

Definition: Information literacy encompasses knowledge and familiarity with different media types, efficient data storage, retrieval methods, and research techniques. For the purposes of this rubric, "information" is not only text-based information, but also includes images, sounds, data sets, databases, artifacts, numerical and statistical data.

TEAMWORK AND COLLABORATION

Definition: Teamwork and Collaboration encompass the ability to work effectively with others in a concerted effort toward a common goal. "Behaviors under the control of individual team members" include efforts put into team tasks, manner of interacting with others on the team, and the quantity and quality of contributions to team discussions.

* Source: AAC&U / VALUE rubric

Regardless of the student's program of study, employers and community leaders desire these competencies; they also serve the broader purpose of preparation for life and citizenship.

Structure of the Masters Degree Program

Graduate education focuses on individualized career advancement in areas of study within science, technology, engineering, and mathematics disciplines. The University's approach is based on an experiential model that allows the student to gain and apply knowledge and skills at an advanced level and to focus on an area of need or interest particular to the student. Faculty combine corporate and academic perspectives in the design, development, and delivery of graduate programs and courses. Programs are primarily designed for working professionals focused on career advancement.

MASTER OF SCIENCE DEGREE MODEL

The curriculum requires a minimum of 36 earned semester hours to fulfill the Master of Science degree requirements. The courses are distributed in the following required areas: Core, Experiential, and Electives. Each requirement is detailed as follows:

CORE COURSES - 15 OR 18 SEMESTER HOURS

Each Master of Science program has Core semester hours that uniquely define the specific program.

ELECTIVES - 12 OR 15 SEMESTER HOURS

Any graduate course from any graduate program not required by the program may be applied toward the elective requirement. This component of the program may be used to complete a concentration in a specific topic or may be used to individualize the student's program of study.

EXPERIENTIAL COURSES - 6 SEMESTER HOURS

The experiential course sequence synthesizes the key concepts of the program extending and applying these concepts to real life practical problems or research investigations. It consists of two courses: a research methodology and writing course, and a Graduate Thesis or Applied Project.

MASTER OF SCIENCE DEGREE - TOTAL OF 36 SEMESTER HOURS

Structure of the Doctorate of Philosophy Degree Program

Doctorate education focuses on enabling the student to make original contributions to their respective fields of study. The curriculum requires a minimum of 36 earned semester hours to fulfill the Doctor of Philosophy degree requirements. Requirements of the program include credit and non-credit coursework outlined in the below Milestones:

Milestone 1

Coursework - 18 to 30 semester hours

Collaborative Institutional Training Initiative (CITI Training)

Qualifying Exam and/or Comprehensive Exam

Degree Audit

Milestone 2

Research Seminar - 6 semester hours

Doctoral Dissertation Committee

Proposal Defense Scheduled

Milestone 3

Proposal Successfully Defended

Milestone 4

Doctoral Studies - 12 semester hours

HU Institutional Review Board Approval

Dissertation Defense Scheduled

Milestone 5

Dissertation Successfully Defended

If appropriate, additional non-credit requirements may be required. Any additional requirements can be found on the student's Plan of Study.

Academic Programs

Graduate education focuses on individualized career advancement in areas of study within science, technology, engineering, and mathematics disciplines. The University's approach is based on an experiential model that allows the student to gain and apply knowledge and skills at an advanced level and to focus on an area of need or interest particular to the student. Faculty combines corporate and academic perspectives in the design, development, and delivery of graduate programs and courses. Programs are primarily designed for working professionals focused on career advancement.

Faculty and Administration

Members or Administration, staff, and full time and part time faculty, their titles, and areas of instruction are available on the University's website at: https://harrisburgu.edu/faculty-and-staff-listing/.

Graduate Academic Programs

M.S. Analytics

This 36-semester hour program prepares the student by providing depth in analytics during the first year and focused functional study during the second year that can be applied to any discipline or any interdisciplinary area. Data analysts are forging new relationships in virtually every discipline: business, healthcare, geology, mathematics and statistics, biology, chemistry, computer science, information systems and technology, engineering, psychology, behavioral science, operations research and more, in addition to potential interactions between these disciplines, using role-based interaction with information and analytics to enable highly- collaborative, data-driven organizations. The graduate of this program enters the workforce prepared for the complex, information-intensive world.

Program Goals

ANMS graduates are able to:

- Identify and assess the opportunities, needs and constraints for data usage;
- Make clear and insightful analyses changing direction quickly as required by these analyses;
- Measure, evaluate, and explain the level of quality of a dataset and develop a plan to improve the quality;
- Work effectively in a team to develop data analytic solutions;
- Recognize and analyze ethical issues related to intellectual property, data security integrity, and privacy; and
- Communicate clearly and persuasively to a variety of audiences.

Graduates become data scientists and analysts in finance, marketing, operations, and business intelligence working groups that generate and consume large amounts of data.

Analytics Requirements

The following courses comprise the Master of Science in Analytics program - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 15 semester hours:

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)

- ANLY 502 - Mathematical Foundations for Data Analysis (3 semester hours)
- ANLY 510 - Analytics II: Principles and Applications (3 semester hours)

- ANLY 506 - Exploratory Data Analysis (3 semester hours)
  or
- ANLY 512 - Data Visualization (3 semester hours)

- ANLY 545 - Categorical Data Analysis (3 semester hours)
  or
- ANLY 560 - Advanced Programming for Data Analytics (3 semester hours)

Complete the following Experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- ANLY 699 - Applied Project in Analytics (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Complete one of the following Concentrations:

Three Concentrations are offered:

- Individualized (15 semester hours)
- Healthcare Informatics (15 semester hours)
- Pharmaceutical Sciences (15 semester hours)

Individualized Concentration (15 semester hours)

The Master of Science in Analytics student can choose electives totaling up to 15 credits from any graduate-level program. This option allows the Analytics student to build their own customized specialization and concentration.

Healthcare Informatics Concentration (15 semester hours)

Complete the following courses - 15 semester hours:

*The student can choose a course from any of the Master of Science programs

- HCIN 500 - Healthcare Informatics (3 semester hours)
- HCIN 515 - Essential Informatics Skills I (3 semester hours)
- HCIN 520 - Essential Informatics Skills II (3 semester hours)
- HCIN 545 - Healthcare Data (3 semester hours)
- Elective (3 semester hours)*

Pharmaceutical Sciences Concentration (15 semester hours)

Complete the following courses - 12 semester hours:

- BTEC 625 - Pharmacogenomics (3 semester hours)
- PHAR 520 - Pharmacokinetics and Pharmacodynamics (3 semester hours)

- PHAR 525 - Drug Transport (3 semester hours)
- PHAR 540 - Drug Metabolism (3 semester hours)

Choose one of the following courses - 3 semester hours

- BTEC 508 - Omics for Life Sciences (3 semester hours)
- BTEC 540 - Biostatistics (3 semester hours)
- BTEC 610 - Advanced Topics in Drug Discovery and Delivery (3 semester hours)
- BTEC 612 - Regulatory Affairs in Life Science Industries (3 semester hours)
- BTEC 634 - Healthcare Economics: Fundamentals for Providers and Biotech Professionals (3 semester hours)
- BTEC 635 - Clinical Pharmacology (3 semester hours)

Analytics, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Analytics Program with an Individualized Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
- ANLY 502 - Mathematical Foundations for Data Analysis (3 semester hours)

Total Semester Hours: 6

Spring Semester

- ANLY 506 - Exploratory Data Analysis (3 semester hours)
  or
- ANLY 512 - Data Visualization (3 semester hours)

- Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- ANLY 510 - Analytics II: Principles and Applications (3 semester hours)

- ANLY 545 - Categorical Data Analysis (3 semester hours)
  or
- ANLY 560 - Advanced Programming for Data Analytics (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- Elective (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Spring Semester

- Elective (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- ANLY 699 - Applied Project in Analytics (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Analytics, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Analytics Program with an Individualized Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

Session 1

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)

Session 2

- ANLY 502 - Mathematical Foundations for Data Analysis (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- ANLY 506 - Exploratory Data Analysis (3 semester hours)
  or
- ANLY 512 - Data Visualization (3 semester hours)

Session 2

- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- ANLY 510 - Analytics II: Principles and Applications (3 semester hours)

Session 2

- ANLY 545 - Categorical Data Analysis (3 semester hours)
  or
- ANLY 560 - Advanced Programming for Data Analytics (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

Session 1

- GRAD 695 - Research Methodology and Writing (3 semester hours)

Session 2

- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- Concentration Elective (3 semester hours)

Session 2

- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- Concentration Elective (3 semester hours)

Session 2

- ANLY 699 - Applied Project in Analytics (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Total Semester Hours: 6

Analytics, Healthcare Informatics Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Analytics Program with the Healthcare Informatics Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

*The student can choose a course from any of the Master of Science programs

**Recommended core course for the student enrolled in Healthcare Informatics Concentration

First Year

Fall

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
- HCIN 500 - Healthcare Informatics (3 semester hours)

Total Semester Hours: 6

Spring

- ANLY 502 - Mathematical Foundations for Data Analysis (3 semester hours)
- HCIN 545 - Healthcare Data (3 semester hours)

Total Semester Hours: 6

Summer

- ANLY 510 - Analytics II: Principles and Applications (3 semester hours)
- HCIN 515 - Essential Informatics Skills I (3 semester hours)

Total Semester Hours: 6

Second Year

Fall

- ANLY 506 - Exploratory Data Analysis (3 semester hours)
  or
- ANLY 512 - Data Visualization (3 semester hours) **

- HCIN 520 - Essential Informatics Skills II (3 semester hours)

Total Semester Hours: 6

Spring

- ANLY 545 - Categorical Data Analysis (3 semester hours) **
  or
- ANLY 560 - Advanced Programming for Data Analytics (3 semester hours)

- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer

- ANLY 699 - Applied Project in Analytics (3 semester hours)
- Elective - (3 semester hours)* *(HCIN 550 recommended)*

Total Semester Hours: 6

Analytics, Healthcare Informatics Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Analytics Program with the Healthcare Informatics Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

*The student can choose a course from any of the Master of Science programs

**Recommended core course for the student enrolled in Healthcare Informatics Concentration

First Year

Fall Semester

Session 1

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)

Session 2

- HCIN 500 - Healthcare Informatics (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- ANLY 502 - Mathematical Foundations for Data Analysis (3 semester hours)

Session 2

- HCIN 545 - Healthcare Data (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- ANLY 510 - Analytics II: Principles and Applications (3 semester hours)

Session 2

- HCIN 515 - Essential Informatics Skills I (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

Session 1

- ANLY 506 - Exploratory Data Analysis (3 semester hours)
  or
- ANLY 512 - Data Visualization (3 semester hours) **

Session 2

- HCIN 520 - Essential Informatics Skills II (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- ANLY 545 - Categorical Data Analysis (3 semester hours) **

or

- ANLY 560 - Advanced Programming for Data Analytics (3 semester hours)

Session 2

- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- ANLY 699 - Applied Project in Analytics (3 semester hours)

Session 2

- Elective (3 semester hours)* *(HCIN 550 recommended)*

Total Semester Hours: 6

Analytics, Pharmaceutical Sciences Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Analytics Program with the Pharmaceutical Sciences Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
- PHAR 520 - Pharmacokinetics and Pharmacodynamics (3 semester hours)

Total Semester Hours: 6

Spring

- ANLY 506 - Exploratory Data Analysis (3 semester hours)
  or
- ANLY 512 - Data Visualization (3 semester hours)

- BTEC 625 - Pharmacogenomics (3 semester hours)

Total Semester Hours: 6

Summer

- PHAR 525 - Drug Transport (3 semester hours)
- PHAR 540 - Drug Metabolism (3 semester hours)

Total Semester Hours: 6

Second Year

Fall

- ANLY 502 - Mathematical Foundations for Data Analysis (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring

- ANLY 510 - Analytics II: Principles and Applications (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer

- ANLY 545 - Categorical Data Analysis (3 semester hours)
  or
- ANLY 560 - Advanced Programming for Data Analytics (3 semester hours)

- ANLY 699 - Applied Project in Analytics (3 semester hours)

Total Semester Hours: 6

M.S. Biotechnology

The 36-semester hour Master of Science degree in Biotechnology provides a comprehensive work-oriented curriculum that explores the industrial, medical, and regulatory underpinnings of the biotechnology field. The program offers a sound foundation in these multiple areas of biotechnology, while integrating the applied and innovative aspects of the science. With a focus on industry-relevant projects, case studies, and real-world scenarios, the program graduates are prepared with the skills and technical expertise to confidently cater to the needs of an ever-growing biotechnology sector.

This master's program prepares the student for biotechnology careers focusing on research and development, leadership, planning, management and marketing. The flexibility of the general degree allows student customization of the coursework to meet individual career goals. The program offers four different concentrations: biomanufacturing, medical biotechnology, biotechnology business and management, and an individualized program of study.

Program Goals

A successful student of the program gains the following skills (vary according to the degree/concentration taken):

- Research biotechnology concepts and developments to determine their relevance to applications in biotechnology;
- Evaluate research literature, emerging technologies, and commercial developments to design and/or develop innovative biotechnology applications and products;
- Work as part of a project team to plan and manage the production of an innovative biotechnology application or product;
- Analyze the global business environment of biotechnology industry including regulations and finance to make ethical decisions that meet the needs of the organization; and,
- Actively communicate and collaborate as part of the global community of biotechnology researchers and developers.

Biotechnology Requirements

The following courses comprise the Master of Science in Biotechnology - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 18 semester hours:

- BTEC 502 - Biomaterials (3 semester hours)
- BTEC 508 - Omics for Life Sciences (3 semester hours)
- BTEC 522 - Graduate Biotechnology Seminar (3 semester hours)
- BTEC 540 - Biostatistics (3 semester hours)
- BTEC 550 - Instrumentation in Biotechnology Industry (3 semester hours)
- BTEC 560 - Design of Experiment (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- BTEC 699 - Applied Project in Biotechnology (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Complete one of the following Concentrations:

Four concentrations are offered:

- Individualized Concentration (12 semester hours)
- Biotechnology Business and Management (12 semester hours)
- Biomanufacturing (12 semester hours)
- Medical Biotechnology (12 semester hours)

**Student can choose a course from any of the Master of Science programs*

Individualized Concentration (12 semester hours)

The Master of Science in Biotechnology student can choose electives totaling up to 12 credits from Biotechnology, Information Systems Engineering and Management, Project Management, and Healthcare Informatics programs at Harrisburg University: This option allows the Biotechnology student to build their own customized specialization and concentration.

Biotechnology Business and Management Concentration (12 semester hours)

Complete 12 semester hours from the following courses:

- BTEC 612 - Regulatory Affairs in Life Science Industries (3 semester hours)
- BTEC 622 - Principles of Accounting and Finance (3 semester hours)
- BTEC 634 - Healthcare Economics: Fundamentals for Providers and Biotech Professionals (3 semester hours)
- BTEC 672 - Legal Affairs and Policies for Life Science Industry (3 semester hours)
- BTEC 675 - Innovation and Improvisation in Research and Development (3 semester hours)
- MGMT 510 - Business Strategy and Management Principles (3 semester hours)
- Elective (3 semester hours) *

Biomanufacturing Concentration (12 semester hours)

Complete 12 semester hours from the following courses:

- BTEC 618 - Principles of Bioprocessing (3 semester hours)
- BTEC 650 - Fermentation Technologies (3 semester hours)
- BTEC 655 - Industrial Enzymes and Proteins (3 semester hours)
- BTEC 675 - Innovation and Improvisation in Research and Development (3 semester hours)
- BTEC 698 - Biotechnology Graduate Internship (3 semester hours)
- Elective (3 semester hours) *

Medical Biotechnology Concentration (12 semester hours)

Complete 12 semester hours from the following courses:

- BTEC 610 - Advanced Topics in Drug Discovery and Delivery (3 semester hours)
- BTEC 615 - Biomedical Devices and Prototyping (3 semester hours)
- BTEC 620 - Emerging Trends in Diagnostics (3 semester hours)

- BTEC 625 - Pharmacogenomics (3 semester hours)
- BTEC 630 - Cancer Biotechnology (3 semester hours)
- BTEC 635 - Clinical Pharmacology (3 semester hours)
- BTEC 640 - Trends in Regenerative Medicine (3 semester hours)
- BTEC 698 - Biotechnology Graduate Internship (3 semester hours)
- Elective (3 semester hours) *

Biotechnology, Biotechnology Business and Management Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Biotechnology with a Concentration in Biotechnology Business and Management

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- BTEC 502 - Biomaterials (3 semester hours)
- Business & Management Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- BTEC 540 - Biostatistics (3 semester hours)
- Business & Management Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- BTEC 550 - Instrumentation in Biotechnology Industry (3 semester hours)
- Business & Management Elective (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- BTEC 508 - Omics for Life Sciences (3 semester hours)
- Business & Management Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- BTEC 522 - Graduate Biotechnology Seminar (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

- BTEC 560 - Design of Experiment (3 semester hours)
- BTEC 699 - Applied Project in Biotechnology (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Total Semester Hours: 6

Biotechnology, Biomanufacturing Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Biotechnology with a Concentration in Biomanufacturing

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- BTEC 502 - Biomaterials (3 semester hours)
- Biomanufacturing Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- BTEC 540 - Biostatistics (3 semester hours)
- Biomanufacturing Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- BTEC 550 - Instrumentation in Biotechnology Industry (3 semester hours)
- Biomanufacturing Elective (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- BTEC 508 - Omics for Life Sciences (3 semester hours)
- Biomanufacturing Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- BTEC 522 - Graduate Biotechnology Seminar (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

- BTEC 560 - Design of Experiment (3 semester hours)
- BTEC 699 - Applied Project in Biotechnology (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Total Semester Hours: 6

Biotechnology, Medical Biotechnology Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Biotechnology with a Concentration in Medical Biotechnology

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- BTEC 502 - Biomaterials (3 semester hours)
- Medical Biotechnology Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- BTEC 540 - Biostatistics (3 semester hours)
- Medical Biotechnology Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- BTEC 550 - Instrumentation in Biotechnology Industry (3 semester hours)
- Medical Biotechnology Elective (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- BTEC 508 - Omics for Life Sciences (3 semester hours)
- Medical Biotechnology Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- BTEC 522 - Graduate Biotechnology Seminar (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

- BTEC 560 - Design of Experiment (3 semester hours)
- BTEC 699 - Applied Project in Biotechnology (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Total Semester Hours: 6

Biotechnology, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Biotechnology with an Individualized Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- BTEC 502 - Biomaterials (3 semester hours)
- Graduate Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- BTEC 540 - Biostatistics (3 semester hours)
- Graduate Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- BTEC 550 - Instrumentation in Biotechnology Industry (3 semester hours)
- Graduate Elective (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- BTEC 508 - Omics for Life Sciences (3 semester hours)
- Graduate Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- BTEC 522 - Graduate Biotechnology Seminar (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

- BTEC 560 - Design of Experiment (3 semester hours)
- BTEC 699 - Applied Project in Biotechnology (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Total Semester Hours: 6

Certificate in Biomanufacturing

This 12-semester hour certificate program prepares the student for a supervisory or managerial role within a Biomanufacturing company or contract manufacturing organization (CRO). Completing this certificate program provides the student with the essential skills of industrial bioprocessing, including principles underlying the recovery, purification, and formulation of biomolecules. Additional content includes the characterization of molecules' fundamental chemical and physical properties that impact downstream processing and formulation development. This program introduces the student to the various classes of biomaterials and their applications in medical/industrial processes. The student explores critical aspects of the manufacturing processes (up-and downstream) and GMP-GLP issues. This certificate also familiarizes the student with instruments used for biotechnology applications and their principles of operation, including the significance of instrument validation and calibration. As a critical component of the program, the student conceptually designs and optimizes a biomanufacturing specific target product. The student learns the primary methodologies and principles of recombinant DNA (rDNA) in modifying, selecting, and applying recombinant prokaryotic and eukaryotic cells for industrial enzyme and protein production. The GRAD 695 course allows the participant to customize the research proposal for their area of interest within the biomanufacturing industry. A student may complete this certificate program as a non-degree graduate student or a Master of Science degree-seeking student.

Complete all the following courses - 12 semester hours:

- BTEC 618 - Principles of Bioprocessing (3 semester hours)
- BTEC 650 - Fermentation Technologies (3 semester hours)
- BTEC 655 - Industrial Enzymes and Proteins (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Certificate in Medical Biotechnology

This 12-semester hour certificate program prepares the student for a career in several fields in the healthcare industry. A current emphasis on biotechnology that has grown exponentially is developing clinically relevant products, both pharmaceutical agents and medical devices, primarily for *in vitro* diagnostics. Several efforts in these areas have led to innovations in diagnostics, biomarker studies, and drug discovery. This certificate program addresses the basics of these three Medical Biotechnology fields using the available information for developing new targeted therapies for precision medicine. The certificate also exposes the student to various biomedical devices and new technologies related to designing, fabricating, and applying multi-array biochips and micro-fluidic systems. The student explores the concepts of developing and validating novel diagnostics technologies and unique biomarker discovery for personalized therapeutic targeting and companion diagnostics. The certificate also introduces the essential concepts of regenerative medicine, focusing on tissue engineering and gene and cell therapy. Additionally, the certificate program provides the student with the traditional and molecular diagnostics and fundamental principles overview. The GRAD 695 course allows the participant to customize the research proposal for their area of interest within the biomedical/healthcare industry. A student may complete this certificate program as a non-degree graduate student or a Master of Science degree-seeking student.

Complete all the following courses - 12 semester hours:

- BTEC 615 - Biomedical Devices and Prototyping (3 semester hours)
- BTEC 620 - Emerging Trends in Diagnostics (3 semester hours)
- BTEC 640 - Trends in Regenerative Medicine (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Certificate in Regulatory-Legal Affairs in Biotechnology

This 12-semester hour certificate program prepares the student for supervisory, administrative, or other leadership positions within the Biotechnology industry. Courses within this program will explore market dynamics, public policy, and technology. The student will learn the basics of tech transfer policies and IPOs, communicating scientific concepts to investors, and preparing regulatory plans. Some course activities will prepare the student to create and analyze legal documents, including tech transfer, product validation, and responding to recall procedures. The curriculum also provides an overview of key legal concepts and policies that govern the biotechnology industry's research, development, and commercial activities. Upon completing this certificate program, the student will have creative problem-solving skills and other competencies necessary for standard approaches in managing biotech research and development as per regulatory guidelines and federal compliance protocols. The GRAD 695 course allows the participant to customize the research proposal for their area of interest within the regulatory-legal affairs area in the biotechnology industry. A student may complete this certificate program as a non-degree graduate student or a Master of Science degree-seeking student.

Complete all the following courses - 12 semester hours:

- BTEC 560 - Design of Experiment (3 semester hours)
- BTEC 612 - Regulatory Affairs in Life Science Industries (3 semester hours)
- BTEC 672 - Legal Affairs and Policies for Life Science Industry (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

M.S. Computer Information Sciences

The 36-semester hour Master of Science degree in Computer Information Sciences provides a challenging opportunity of pursuing a versatile course of study reflecting the student's desire, background and future responsibilities. The program includes a variety of specialties that are covered in depth to probe the frontiers of scientific and engineering knowledge in the domain. A graduate of the program is able to integrate computational, interpersonal and team skills, to secure a professional employment or pursue a doctoral degree in the field.

The Master of Science degree in Computer Information Sciences also provides the student with solid foundations of scientific and practical tools and methodologies to computation, its applications and emerging trends, in a variety of subdomains. The student explores approaches including computing systems architecture, mathematical and data structures techniques for modeling simulation of complex systems; cluster computing and collaborative software development, and efficient methods for organizing, exploring, visualizing, processing and analyzing very large data sets.

Program Goals

A successful student of the program gains the following skills (vary according to the degree/concentration taken):

- Recognize the necessity for conducting theoretical and empirical analysis;
- Master at least one knowledge area or sub-area from the body of knowledge to at least the Bloom Synthesis level;
- Adapt to rapidly changing technology, advanced learning, and entrepreneurship qualities;
- Have strong scientific communication skills;
- Possess excellent teamwork skills;
- Adhere to the ethical standards and moral obligations as a condition of their membership in the profession; and,
- Employ concepts that promote local and global systems for quality of life.

Computer Information Sciences Requirements

The following courses comprise the Master of Science in Computer Information Sciences - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 15 semester hours:

- CISC 520 - Data Engineering and Mining (3 semester hours)
- CISC 525 - Big Data Architectures (3 semester hours)
- CISC 530 - Computing Systems Architecture (3 semester hours)
- CISC 603 - Theory of Computation (3 semester hours)
- CISC 610 - Data Structures and Algorithms (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- CISC 699 - Applied Project in Computer Information Sciences (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Complete one of the following Concentrations:

Three Concentrations are offered:

- Scientific Computing (15 semester hours)
- Software Engineering and Software Testing (15 semester hours)
- Cyber Security (15 semester hours)

* *Student can choose a course from any of the Master of Science programs.*

Scientific Computing Concentration (15 semester hours)

Complete the following courses - 15 semester hours:

- CISC 600 - Scientific Computing I (3 semester hours)
- CISC 601 - Scientific Computing II (3 semester hours)
- CISC 614 - Computer Simulation (3 semester hours)

- Elective (3 semester hours) *
  or
- CISC 681 - Special Topics in Scientific Computing (3 semester hours)

- Elective (3 semester hours) *
  or
- CISC 691 - Current Topics in Scientific Computing (3 semester hours)

Software Engineering and Software Testing Concentration (15 semester hours)

Complete the following courses - 15 semester hours:

- CISC 592 - Software Architecture and Microservice (3 semester hours)
- CISC 593 - Software Verification and Validation (3 semester hours)
- CISC 594 - Software Testing Principles and Techniques (3 semester hours)

- Elective (3 semester hours) *
  or
- CISC 682 - Special Topics in Software Engineering and Software Testing (3 semester hours)

- Elective (3 semester hours) *
  or
- CISC 692 - Current Topics in Software Engineering and Software Testing (3 semester hours)

Cyber Security Concentration (15 semester hours)

Complete the following courses - 15 semester hours:

- CISC 661 - Principles of Cybersecurity & Cyber Warfare (3 semester hours)
- CISC 662 - Ethical Hacking Development Lab (3 semester hours)

- CISC 663 - Cyber Risk Assessment and Management (3 semester hours)

- Elective (3 semester hours) *
  or
- CISC 683 - Special Topics in Cyber Security (3 semester hours)

- Elective (3 semester hours) *
  or
- CISC 693 - Current Topics in Cyber Security (3 semester hours)

Computer Information Sciences, Scientific Computing Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Computer Information Sciences Program with a concentration in Scientific Computing

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- CISC 530 - Computing Systems Architecture (3 semester hours)
- CISC 610 - Data Structures and Algorithms (3 semester hours)

Total Semester Hours: 6

Spring Semester

- CISC 520 - Data Engineering and Mining (3 semester hours)
- CISC 600 - Scientific Computing I (3 semester hours)

Total Semester Hours: 6

Summer Semester

- CISC 601 - Scientific Computing II (3 semester hours)
- CISC 603 - Theory of Computation (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- CISC 525 - Big Data Architectures (3 semester hours)
- CISC 614 - Computer Simulation (3 semester hours)

Total Semester Hours: 6

Spring Semester

- Elective (3 semester hours)
  or
- CISC 691 - Current Topics in Scientific Computing (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

- Elective (3 semester hours)
  or
- CISC 681 - Special Topics in Scientific Computing (3 semester hours)
- CISC 699 - Applied Project in Computer Information Sciences (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Total Semester Hours: 6

Computer Information Sciences, Software Engineering and Software Testing Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Computer Information Sciences Program with a concentration in Software Engineering & Software Testing

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- CISC 530 - Computing Systems Architecture (3 semester hours)
- CISC 610 - Data Structures and Algorithms (3 semester hours)

Total Semester Hours: 6

Spring Semester

- CISC 520 - Data Engineering and Mining (3 semester hours)
- CISC 592 - Software Architecture and Microservice (3 semester hours)

Total Semester Hours: 6

Summer Semester

- CISC 593 - Software Verification and Validation (3 semester hours)
- CISC 603 - Theory of Computation (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- CISC 525 - Big Data Architectures (3 semester hours)
- CISC 594 - Software Testing Principles and Techniques (3 semester hours)

Total Semester Hours: 6

Spring Semester

- Elective (3 semester hours)
  or
- CISC 692 - Current Topics in Software Engineering and Software Testing (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

- Elective (3 semester hours)
  or
- CISC 682 - Special Topics in Software Engineering and Software Testing (3 semester hours)
- CISC 699 - Applied Project in Computer Information Sciences (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Total Semester Hours: 6

Computer Information Sciences, Cyber Security Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Computer Information Sciences Program with a concentration in Cyber Security

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- CISC 530 - Computing Systems Architecture (3 semester hours)
- CISC 610 - Data Structures and Algorithms (3 semester hours)

Total Semester Hours: 6

Spring Semester

- CISC 520 - Data Engineering and Mining (3 semester hours)
- CISC 661 - Principles of Cybersecurity & Cyber Warfare (3 semester hours)

Total Semester Hours: 6

Summer Semester

- CISC 603 - Theory of Computation (3 semester hours)
- CISC 662 - Ethical Hacking Development Lab (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- CISC 525 - Big Data Architectures (3 semester hours)
- CISC 663 - Cyber Risk Assessment and Management (3 semester hours)

Total Semester Hours: 6

Spring Semester

- Elective (3 semester hours)
  or
- CISC 693 - Current Topics in Cyber Security (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

- Elective (3 semester hours)
  or
- CISC 683 - Special Topics in Cyber Security (3 semester hours)
- CISC 699 - Applied Project in Computer Information Sciences (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Total Semester Hours: 6

M.S. Consumer Behavior and Decision Sciences

This 36-semester hour Master of Science degree in Consumer Behavior and Decision Sciences is an applied behavioral research degree driven by industry and public sector demand for actionable insights into human behavior. The degree prepares students to pursue marketable careers in applied behavioral research (e.g., Consumer Insights Manager, Market Research Analyst, Marketing Manager, Sensory Scientist, and Behavioral Scientist). Graduates will be able to assess consumer (broadly defined) preferences (insights) using a variety of traditional and emergent research methodologies and turn those insights into actionable strategies using quantitative/qualitative decision making.

Program Goals

Graduates of the Master of Science in the Consumer Behavior and Decision Sciences program will be able to:

- Determine the best research methodologies to employ in order to gain robust consumer insights;
- Turn consumer insights into actionable recommendations through the application of appropriate analytic techniques;
- Effectively communicate consumer research to diverse audiences; and
- Innovate consumer research.

Consumer Behavior and Decision Sciences Requirements

The following courses comprise the Master of Science in Consumer Behavior and Decision Sciences - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 24 semester hours:

- ANLY 510 - Analytics II: Principles and Applications (3 semester hours)
- ANLY 512 - Data Visualization (3 semester hours)
- CBDS 520 - Judgement and Decision Making (3 semester hours)
- CBDS 535 - Quantitative Research Methods (3 semester hours)
- CBDS 545 - Qualitative Research Methods (3 semester hours)
- CBDS 550 - Sampling and Segmentation (3 semester hours)
- CBDS 620 - Marketing Applications (3 semester hours)
- CBDS 680 - Special Topics in Applied Behavioral Research (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- CBDS 695 - Advanced Behavioral Research Methods (3 semester hours)
- CBDS 699 - Applied Behavioral Research Project (3 semester hours)

Complete two of the following elective courses - 6 semester hours:

- ANLY 520 - Natural Language Processing (3 semester hours)
- ANLY 530 - Principles and Applications of Machine Learning (3 semester hours)
- HCID 510 - Theories of Human Interaction (3 semester hours)
- HCID 520 - Users and Populations (3 semester hours)

- PMGT 510 - Principles of Project Management (3 semester hours)

Consumer Behavior and Decision Sciences Sequence

Recommended Sequence for the Two-Year Master of Science in Consumer Behavior and Decision Sciences

The sequence that appears below is based upon the availability of specific courses each semester and the successful completion of course prerequisites.

First Year

Fall

- ANLY 510 - Analytics II: Principles and Applications (3 semester hours)
- CBDS 520 - Judgement and Decision Making (3 semester hours)

Total Semester Hours: 6

Spring

- ANLY 512 - Data Visualization (3 semester hours)
- CBDS 535 - Quantitative Research Methods (3 semester hours)

Total Semester Hours: 6

Summer

- CBDS 545 - Qualitative Research Methods (3 semester hours)
- CBDS 550 - Sampling and Segmentation (3 semester hours)

Total Semester Hours: 6

Second Year

Fall

- CBDS 695 - Advanced Behavioral Research Methods (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Spring

- CBDS 620 - Marketing Applications (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Summer

- CBDS 680 - Special Topics in Applied Behavioral Research (3 semester hours)
- CBDS 699 - Applied Behavioral Research Project (3 semester hours)

Total Semester Hours: 6

M.S. Cybersecurity Operations and Control Management

The 36-semester hour Master of Science degree in Cybersecurity Operations and Control Management focuses on architecture and engineering of computer network security. The student acquires the skills to secure network information, design computer security architecture, and data security engineering as well as obtain leadership skills, understanding of ethics, and compliance knowledge.

Program Goals

- Examine the many aspects and ramifications of the internet and the wide spectrum of applications;
- Differentiate the working elements of computer networks and infrastructures;
- Apply the latest advances in internet security to protect the networks for a variety of applications;
- Investigate emerging technologies of complex contemporary security measures; and,
- Explore common ethical and public policy problems that arise and how technology/law solve them.

Cybersecurity Operations and Control Management Requirements

The following courses comprise the Master of Science in Cybersecurity Operations and Control Management - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 15 semester hours:

- CYOM 503 - Principles of Computer Networking (3 semester hours)
- CYOM 521 - Cybersecurity Architecture and Resiliency (3 semester hours)
- CYOM 535 - Principles of Cloud Security (3 semester hours)
- CYOM 569 - Securing Software and Application Environments (3 semester hours)
- CYOM 599 - Leadership, Ethics, and Compliance in Cybersecurity Industry (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- CYOM 699 - Applied Project in Cybersecurity Operations and Control Management (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Complete the following Concentration:

** The student can choose a course from any of the Master of Science programs.*

Cybersecurity and Cyber Warfare Concentration (15 semester hours)

Complete the following courses - 15 semester hours:

- CYOM 661 - Principles of Cybersecurity & Cyber Warfare (3 semester hours)
- CYOM 662 - Ethical Hacking Development Lab (3 semester hours)
- CYOM 663 - Cyber Risk Assessment and Management (3 semester hours)

- CYOM 683 - Special Topics in Cybersecurity Operations and Control Management (3 semester hours)

or

- Elective (3 semester hours)*

- CYOM 693 - Current Topics in Cybersecurity Operations and Control Management (3 semester hours)
  or
- Elective (3 semester hours)*

Cybersecurity Operations and Control Management, Cybersecurity and Cyber Warfare Concentration Sequence

Recommended Sequence for the Two-Year Master of Science Cybersecurity Operations and Control Management Program with a concentration in Cybersecurity and Cyber Warfare

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- CYOM 503 - Principles of Computer Networking (3 semester hours)
- CYOM 599 - Leadership, Ethics, and Compliance in Cybersecurity Industry (3 semester hours)

Total Semester Hours: 6

Spring Semester

- CYOM 521 - Cybersecurity Architecture and Resiliency (3 semester hours)
- CYOM 535 - Principles of Cloud Security (3 semester hours)

Total Semester Hours: 6

Summer Semester

- CYOM 569 - Securing Software and Application Environments (3 semester hours)
- CYOM 661 - Principles of Cybersecurity & Cyber Warfare (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- CYOM 662 - Ethical Hacking Development Lab (3 semester hours)
- CYOM 663 - Cyber Risk Assessment and Management (3 semester hours)

Total Semester Hours: 6

Spring Semester

- CYOM 693 - Current Topics in Cybersecurity Operations and Control Management (3 semester hours)
  or
- Elective (3 semester hours)

- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

- CYOM 683 - Special Topics in Cybersecurity Operations and Control Management (3 semester hours)
  or
- Elective (3 semester hours)

- CYOM 699 - Applied Project in Cybersecurity Operations and Control Management (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Total Semester Hours: 6

M.S. Healthcare Informatics

The 36-semester hour graduate program in Healthcare Informatics provides clinicians with knowledge and experience that allows them to function as valued team members selecting, installing, adopting, employing, evaluating, and optimizing healthcare-related IT systems, such as Electronic Medical Records (EMRs), in today's healthcare delivery systems. The clinical objectives of healthcare informatics are to enhance individual and population health outcomes, improve patient care, and strengthen the clinician-patient relationship. This program emphasizes translational, communication and interpersonal skills during the selection, implementation, and optimization of healthcare IT systems while providing a solid base in informatics practice, analytics tools, and the management, capture, analysis, and governance of healthcare data. These skills are necessary for effective change management of healthcare providers, for knowledge management in the institution, and for effective communication of key information and insights to both colleagues and senior decision makers.

Program Goals

A successful student of the program gains the following skills (vary according to the degree/concentration taken):

- Lead healthcare information technology teams to analyze healthcare-related IT systems;
- Evaluate today's analytic tools to select the appropriate tools for data analyses;
- Lead healthcare information technology teams to develop innovative techniques;
- Leverage insights from analysis of healthcare data and evaluation of the socio-political environment to devise programs aimed at improving the health of the community; and,
- Apply appropriate principles to create clear and effective communications for a variety of audiences.

Healthcare Informatics Requirements

The following courses comprise the Master of Science in Healthcare Informatics - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 15 semester hours:

- HCIN 500 - Healthcare Informatics (3 semester hours)
- HCIN 515 - Essential Informatics Skills I (3 semester hours)
- HCIN 520 - Essential Informatics Skills II (3 semester hours)
- HCIN 545 - Healthcare Data (3 semester hours)
- HCIN 550 - Introduction to Healthcare Analytics (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- HCIN 699 - Applied Project in Healthcare Informatics (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Complete the following Concentration:

Individualized Concentration (15 semester hours)

Complete 15 semester hours of graduate-level courses, with the approval of the student's faculty advisor, from the Harrisburg University course catalog. This allows the student to obtain educational experiences that apply directly to personal interests and goals within the broad scope of healthcare informatics. The following courses are likely to be among those selected (15 semester hours):

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
- ANLY 502 - Mathematical Foundations for Data Analysis (3 semester hours)
- ANLY 506 - Exploratory Data Analysis (3 semester hours)
- ANLY 510 - Analytics II: Principles and Applications (3 semester hours)
- ANLY 512 - Data Visualization (3 semester hours)
- ANLY 515 - Risk Modeling and Assessment (3 semester hours)
- ANLY 525 - Quantitative Decision-Making (3 semester hours)
- ANLY 545 - Categorical Data Analysis (3 semester hours)
- ANLY 560 - Advanced Programming for Data Analytics (3 semester hours)
- BTEC 634 - Healthcare Economics: Fundamentals for Providers and Biotech Professionals (3 semester hours)
- CISC 520 - Data Engineering and Mining (3 semester hours)
- CISC 525 - Big Data Architectures (3 semester hours)
- HCID 500 - Design Perspectives (3 semester hours)
- HCID 504 - Qualitative Discovery Research (3 semester hours)
- HCID 520 - Users and Populations (3 semester hours)
- HCID 540 - Design Tools and Processes (3 semester hours)
- HCID 570 - Design Patterns and Contexts (3 semester hours)
- HCIN 525 - Healthcare Case Studies Using Predictive Analysis (3 semester hours)
- HCIN 541 - Healthcare Systems (3 semester hours)
- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)
- ISEM 501 - Introduction to Digital Technologies (3 semester hours)
- ISEM 525 - Business Process Modeling and Workflow Systems (3 semester hours)
- ISEM 565 - Business Intelligence and Decision Support Systems (3 semester hours)
- MGMT 510 - Business Strategy and Management Principles (3 semester hours)
- MGMT 511 - Digital and Global Enterprises (3 semester hours)
- MGMT 520 - Professional Communication (3 semester hours)
- MGMT 560 - Organizational Leadership (3 semester hours)
- PMGT 510 - Principles of Project Management (3 semester hours)
- PMGT 540 - Planning and Executing Projects (3 semester hours)
- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)

Healthcare Informatics, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Healthcare Informatics with an Individualized Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- HCIN 500 - Healthcare Informatics (3 semester hours)

- HCIN 541 - Healthcare Systems (3 semester hours)
  or
- Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- HCIN 545 - Healthcare Data (3 semester hours)
- HCIN 515 - Essential Informatics Skills I (3 semester hours)

Total Semester Hours: 6

Summer Semester

- HCIN 520 - Essential Informatics Skills II (3 semester hours)
- HCIN 550 - Introduction to Healthcare Analytics (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- Elective (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- Elective (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer Semester

- Elective (3 semester hours)

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- HCIN 699 - Applied Project in Healthcare Informatics (3 semester hours)

Total Semester Hours: 6

Healthcare Informatics, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Healthcare Informatics with an Individualized Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

Session 1

- HCIN 500 - Healthcare Informatics (3 semester hours)

Session 2

- HCIN 541 - Healthcare Systems (3 semester hours)
  or
- Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- HCIN 515 - Essential Informatics Skills I (3 semester hours)

Session 2

- HCIN 545 - Healthcare Data (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- HCIN 520 - Essential Informatics Skills II (3 semester hours)

Session 2

- HCIN 550 - Introduction to Healthcare Analytics (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

Session 1

- Elective (3 semester hours)

Session 2

- Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- GRAD 695 - Research Methodology and Writing (3 semester hours)

Session 2

- Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- Elective (3 semester hours)

Session 2

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- HCIN 699 - Applied Project in Healthcare Informatics (3 semester hours)

Total Semester Hours: 6

Certificate in Healthcare Informatics

This 15-semester hour certificate program in Healthcare Informatics prepares the student with the basics of healthcare informatics in order to function effectively as project champions for healthcare information technology implementations and other basic informatics functions. A student may complete this program as a non-degree graduate student or as a Master of Science degree-seeking student.

Complete all of the following courses - 15 semester hours:

- HCIN 500 - Healthcare Informatics (3 semester hours)
- HCIN 515 - Essential Informatics Skills I (3 semester hours)
- HCIN 520 - Essential Informatics Skills II (3 semester hours)
- HCIN 545 - Healthcare Data (3 semester hours)
- HCIN 550 - Introduction to Healthcare Analytics (3 semester hours)

M.S. Human-Centered Interaction Design

The 36-semester hour graduate program in Human-Centered Interaction Design is designed to promote the human-centered collaborative mindsets that are required for careers in the research, specifications, and development of technologically-driven experiences. The program is interdisciplinary, bringing together the application of knowledge drawn from the social and behavioral sciences, information science, software engineering and project management. The student is taught a balance of theories, methods, skills, and processes.

Program Goals

- Demonstrate foundational knowledge of theories and applications from human behavior and design science;
- Communicate, collaborate and coordinate effectively across diverse populations and media;
- Effectively research people, document problems, and determine research relevance;
- Reflect on self as designer and professional; and
- Design and produce engaging interventions facilitated by digital technologies.

Human-Centered Interaction Design Requirements

The following courses comprise the Master of Science in Human-Centered Interaction Design - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 18 semester hours:

- HCID 500 - Design Perspectives (3 semester hours)
- HCID 504 - Qualitative Discovery Research (3 semester hours)
- HCID 510 - Theories of Human Interaction (3 semester hours)
- HCID 520 - Users and Populations (3 semester hours)
- HCID 540 - Design Tools and Processes (3 semester hours)
- HCID 570 - Design Patterns and Contexts (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)
  and
- GRAD 699 - Graduate Thesis (3 semester hours)

  or

- HCID 695 - Design Research Studio (3 semester hours)
  and
- HCID 699 - Applied Project in Human-Centered Interaction Design (3 semester hours)

Complete the following Concentration:

Individualized Concentration (12 semester hours)

The Master of Science in Human-Centered Interaction Design student must take 12 elective credits (9 credits of existing courses with advisor consultation/approval and a 3 credit HCID 680 Special Topics course). Existing course offerings across Harrisburg University's master's degree programs will provide the student with opportunities to deepen their skills and knowledge of cognate areas in Analytics, Healthcare IT, E-Business, and IS/IT Management, dependent on the student's interest. Upon acceptance to the program, the student will receive one-on-one advising to craft an appropriate program of study that balances the core focus in HCID, with complementary training from other Harrisburg University graduate programs. The intent is to provide the student with personally relevant training in subject and skill areas that align to the student's career goals.

Human-Centered Interaction Design, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Human-Centered Interaction Design with the Individualized Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- HCID 500 - Design Perspectives (3 semester hours)
- HCID 504 - Qualitative Discovery Research (3 semester hours)

Total Semester Hours: 6

Spring Semester

- HCID 510 - Theories of Human Interaction (3 semester hours)
- HCID 520 - Users and Populations (3 semester hours)

Total Semester Hours: 6

Summer Semester

- HCID 570 - Design Patterns and Contexts (3 semester hours)
- HCID 680 - Special Topics in Human-Centered Interaction Design (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- HCID 540 - Design Tools and Processes (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- GRAD 695 - Research Methodology and Writing (3 semester hours)
  or
- HCID 695 - Design Research Studio (3 semester hours)

- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- HCID 699 - Applied Project in Human-Centered Interaction Design (3 semester hours)

- Concentration Elective (3 semester hours)

Total Semester Hours: 6

M.S. Information Systems Engineering and Management

The 36-semester hour graduate program in Information Systems Engineering and Management (ISEM) is designed to educate the leaders who can plan, architect, integrate, and manage the systems needed to support the modern digital enterprises. Graduate studies in ISEM cut across the following three active areas of work:

- Information Systems - latest technologies and approaches (e.g. web-based components, mobile computing and wireless communications, artificial intelligence, and emerging technologies);
- Systems Engineering - systems thinking and emphasis on systems instead of individual components; enterprise architectures consisting of people, processes and technologies; and
- Management - business strategies, entrepreneurship, planning integration, security, governance, global enterprises, and agile enterprises.

ISEM is a flexible and interdisciplinary program that emphasizes the enterprise architecture, planning and management issues at global levels. An ISEM student may specialize in the following areas: artificial intelligence, business intelligence, digital government, digital health, digital transformation, entrepreneurship, information security, smart cities, software engineering, systems development, and technology management as part of their individualized concentration.

Program Goals

ISEM graduates are able to:

- Formulate and implement business strategies;
- Articulate knowledge of various system components associated with digital enterprises;
- Recognize the interrelationship between various system components;
- Formulate the design and planning processes involving information, engineering, and management systems; and
- Lead the management for primary operational functions within modern enterprises.

Information Systems Engineering and Management Requirements

The following courses comprise the Master of Science in Information Systems Engineering and Management program - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses (15 semester hours)

Complete the following courses - 9 semester hours:

- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)
- ISEM 540 - Enterprise Architecture and Integration (3 semester hours)
- MGMT 510 - Business Strategy and Management Principles (3 semester hours)

Complete one of the following courses - 3 semester hours:

- CISC 510 - Object-Oriented Software (3 semester hours)
- ENTP 500 - Entrepreneurship and Innovation (3 semester hours)
- ISEM 502 - User-Centered Design (3 semester hours)
- ISEM 503 - Artificial Intelligence Principles and Applications (3 semester hours)
- ISEM 530 - Systems Engineering Principles (3 semester hours)
- ISEM 565 - Business Intelligence and Decision Support Systems (3 semester hours)

- ISEM 574 - Bitcoin Blockchain (3 semester hours)
- LTMS 531 - Designing Serious Games and Simulations (3 semester hours)
- QISC 530 - Foundations of Quantum Information Science (3 semester hours)

Complete one of the following courses - 3 semester hours:

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
- ENTP 510 - Entrepreneurship: From Traction to Scale (3 semester hours)
- ISEM 528 - Industry Analysis and Technology Patterns (3 semester hours)
- MGMT 511 - Digital and Global Enterprises (3 semester hours)
- PMGT 510 - Principles of Project Management (3 semester hours)
- QISC 550 - Programming Quantum Computers (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- ISEM 699 - Applied Project in Information Systems Engineering and Management (3 semester hours)

Complete one of the following Concentrations:

Four Concentrations are offered:

- Individualized (15 semester hours)
- Next Generation Technologies (15 semester hours)
- Quantum Information Sciences (15 semester hours)
- Techpreneurship (15 semester hours)

**The student can choose a course from any of the Master of Science programs*

***If the course is taken to meet ISEM Core requirement, then the student must select a different course as an elective from any of the Master of Science programs*

Individualized Concentration (15 semester hours)

The Master of Science in Information Engineering and Management (ISEM) student can choose courses totaling 15 semester hours of credit from any of the graduate programs at Harrisburg University. This option allows the ISEM student to build their own customized specialization and concentration. Although the ISEM student can take any courses from any graduate program, they are encouraged to choose electives that focus on their professional area of specialization. In addition, the ISEM student is expected to use the concepts learned in these electives to strengthen their capstone courses. Suggested elective courses that focus on specialization areas such as Analytics, Artificial Intelligence, Business Intelligence, Digital Enterprises, Digital Technologies, Information Security, Smart-Cities, Technology Management, and many others are listed in the ISEM Student Guide available at www.ngecenter.org (ISEM Corner) or by contacting the student's ISEM advisor or program lead.

Next Generation Technologies Concentration (15 semester hours)

Complete the following courses - 15 semester hours:

- Concentration Elective (3 semester hours)*

- ISEM 515 - Commercialization of New Technologies (3 semester hours)
  or
- Concentration Elective course relating to Blockchains (3 semester hours)

- ISEM 528 - Industry Analysis and Technology Patterns (3 semester hours) **
- ISEM 574 - Bitcoin Blockchain (3 semester hours) **

- Concentration Elective course related to Emerging Technologies (3 semester hours)
  or
- Concentration Elective course in Quantum Information Sciences (3 semester hours)

Quantum Information Sciences Concentration (15 semester hours)

Complete the following courses - 15 semester hours:

- QISC 530 - Foundations of Quantum Information Science (3 semester hours) **
- QISC 550 - Programming Quantum Computers (3 semester hours) **
- QISC 570 - Algorithms and Applications of Quantum Computing (3 semester hours)
- QISC 575 - Emerging Topics in Quantum Information Science (3 semester hours)
- Elective (3 semester hours)*

Techpreneurship Concentration (15 semester hours)

Complete the following courses - 15 semester hours:

- ENTP 500 - Entrepreneurship and Innovation (3 semester hours) **
- ENTP 510 - Entrepreneurship: From Traction to Scale (3 semester hours) **
- ENTP 520 - Economics of Innovation (3 semester hours)
- ENTP 530 - Financial Sustainability (3 semester hours)
- Elective (3 semester hours)*

Information Systems Engineering and Management, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Information Systems Engineering and Management Program with the Individualized Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)
- MGMT 510 - Business Strategy and Management Principles (3 semester hours)

Total Semester Hours: 6

Spring Semester

- ISEM 540 - Enterprise Architecture and Integration (3 semester hours)

- CISC 510 - Object-Oriented Software (3 semester hours)
  or
- ENTP 500 - Entrepreneurship and Innovation (3 semester hours)
  or
- ISEM 502 - User-Centered Design (3 semester hours)
  or
- ISEM 503 - Artificial Intelligence Principles and Applications (3 semester hours)
  or
- ISEM 530 - Systems Engineering Principles (3 semester hours)
  or
- ISEM 565 - Business Intelligence and Decision Support Systems (3 semester hours)
  or
- ISEM 574 - Bitcoin Blockchain (3 semester hours)
  or
- LTMS 531 - Designing Serious Games and Simulations (3 semester hours)
  or
- QISC 530 - Foundations of Quantum Information Science (3 semester hours)

Total Semester Hours: 6

Summer Semester

- Concentration Elective (3 semester hours)

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
  or
- ENTP 510 - Entrepreneurship: From Traction to Scale (3 semester hours)
  or
- ISEM 528 - Industry Analysis and Technology Patterns (3 semester hours)
  or
- MGMT 511 - Digital and Global Enterprises (3 semester hours)
  or
- PMGT 510 - Principles of Project Management (3 semester hours)
  or
- QISC 550 - Programming Quantum Computers (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- Concentration Elective (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- GRAD 695 - Research Methodology and Writing (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- ISEM 699 - Applied Project in Information Systems Engineering and Management (3 semester hours)

- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Information Systems Engineering and Management, Next Generation Technologies Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Information Systems Engineering and Management Program with the Next Generation Technologies Concentration

The sequence that appears below is based upon the availability of specific
courses in each semester and the successful completion of course prerequisites.

First Year

Fall

- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)
- MGMT 510 - Business Strategy and Management Principles (3 semester hours)

Total Semester Hours: 6

Spring

- ISEM 540 - Enterprise Architecture and Integration (3 semester hours)

- CISC 510 - Object-Oriented Software (3 semester hours)
  or
- ENTP 500 - Entrepreneurship and Innovation (3 semester hours)
  or
- ISEM 502 - User-Centered Design (3 semester hours)
  or
- ISEM 503 - Artificial Intelligence Principles and Applications (3 semester hours)
  or

- ISEM 530 - Systems Engineering Principles (3 semester hours)
  or
- ISEM 565 - Business Intelligence and Decision Support Systems (3 semester hours)
  or
- LTMS 531 - Designing Serious Games and Simulations (3 semester hours)
  or
- QISC 530 - Foundations of Quantum Information Science (3 semester hours)

Total Semester Hours: 6

Summer

- ISEM 528 - Industry Analysis and Technology Patterns (3 semester hours)

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
  or
- ENTP 510 - Entrepreneurship: From Traction to Scale (3 semester hours)
  or
- MGMT 511 - Digital and Global Enterprises (3 semester hours)
  or
- PMGT 510 - Principles of Project Management (3 semester hours)
  or
- QISC 550 - Programming Quantum Computers (3 semester hours)

Total Semester Hours: 6

Second Year

Fall

- ISEM 574 - Bitcoin Blockchain (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring

- GRAD 695 - Research Methodology and Writing (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Summer

- Concentration Elective (3 semester hours)

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- ISEM 699 - Applied Project in Information Systems Engineering and Management (3 semester hours)

Total Semester Hours: 6

Information Systems Engineering and Management, Quantum Information Sciences Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Information Systems Engineering and Management Program with the Quantum Information Sciences Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall

- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)
- MGMT 510 - Business Strategy and Management Principles (3 semester hours)

Total Semester Hours: 6

Spring

- ISEM 540 - Enterprise Architecture and Integration (3 semester hours)

- CISC 510 - Object-Oriented Software (3 semester hours)
  or
- ENTP 500 - Entrepreneurship and Innovation (3 semester hours)
  or
- ISEM 502 - User-Centered Design (3 semester hours)
  or
- ISEM 503 - Artificial Intelligence Principles and Applications (3 semester hours)
  or
- ISEM 530 - Systems Engineering Principles (3 semester hours)
  or
- ISEM 565 - Business Intelligence and Decision Support Systems (3 semester hours)
  or
- ISEM 574 - Bitcoin Blockchain (3 semester hours)
  or
- LTMS 531 - Designing Serious Games and Simulations (3 semester hours)

Total Semester Hours: 6

Summer

- QISC 530 - Foundations of Quantum Information Science (3 semester hours)

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
  or
- ENTP 510 - Entrepreneurship: From Traction to Scale (3 semester hours)
  or

- ISEM 528 - Industry Analysis and Technology Patterns (3 semester hours)
  or
- MGMT 511 - Digital and Global Enterprises (3 semester hours)
  or
- PMGT 510 - Principles of Project Management (3 semester hours)

Total Semester Hours: 6

Second Year

Fall

- QISC 550 - Programming Quantum Computers (3 semester hours)
- QISC 575 - Emerging Topics in Quantum Information Science (3 semester hours)

Total Semester Hours: 6

Spring

- GRAD 695 - Research Methodology and Writing (3 semester hours)
- QISC 570 - Algorithms and Applications of Quantum Computing (3 semester hours)

Total Semester Hours: 6

Summer

- Elective (3 semester hours)

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- ISEM 699 - Applied Project in Information Systems Engineering and Management (3 semester hours)

Total Semester Hours: 6

Information Systems Engineering and Management, Techpreneurship Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Information Systems Engineering and Management Program with the Techpreneurship Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall

- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)
- MGMT 510 - Business Strategy and Management Principles (3 semester hours)

Total Semester Hours: 6

Spring

- ISEM 540 - Enterprise Architecture and Integration (3 semester hours)

- CISC 510 - Object-Oriented Software (3 semester hours)
  or
- ISEM 502 - User-Centered Design (3 semester hours)
  or
- ISEM 503 - Artificial Intelligence Principles and Applications (3 semester hours)
  or
- ISEM 530 - Systems Engineering Principles (3 semester hours)
  or
- ISEM 565 - Business Intelligence and Decision Support Systems (3 semester hours)
  or
- ISEM 574 - Bitcoin Blockchain (3 semester hours)
  or
- LTMS 531 - Designing Serious Games and Simulations (3 semester hours)
  or
- QISC 530 - Foundations of Quantum Information Science (3 semester hours)

Total Semester Hours: 6

Summer

- ENTP 500 - Entrepreneurship and Innovation (3 semester hours)

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
  or
- ISEM 528 - Industry Analysis and Technology Patterns (3 semester hours)
  or
- MGMT 511 - Digital and Global Enterprises (3 semester hours)
  or
- PMGT 510 - Principles of Project Management (3 semester hours)
  or
- QISC 550 - Programming Quantum Computers (3 semester hours)

Total Semester Hours: 6

Second Year

Fall

- ENTP 510 - Entrepreneurship: From Traction to Scale (3 semester hours)
- ENTP 520 - Economics of Innovation (3 semester hours)

Total Semester Hours: 6

Spring

- ENTP 530 - Financial Sustainability (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Summer

- Elective (3 semester hours)

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- ISEM 699 - Applied Project in Information Systems Engineering and Management (3 semester hours)

Total Semester Hours: 6

Advanced Studies in Smart Enterprises Post-Master Program

The purpose of this Advanced Studies Program is to allow a student with an Information Systems Management and Engineering master's degree to further their knowledge in chosen areas. In particular, the student will be able to pursue areas of interest both within and outside of ISEM to create a tailored body of knowledge at a higher level of achievement than the master's degree. The student will be able to use this knowledge in pursuit of career choices and in additional educational pursuits.

Program Goals

The student completing the Advanced Studies in Smart Enterprises Program will be able to:

- Articulate knowledge of various system components associated with digital enterprises;
- Recognize the interrelationship between various system components; and,
- Formulate the design and planning processes involving information, engineering, and management systems.

Advanced Studies in Smart Enterprises Program Requirements

The following courses comprise the Advanced Post-Masters Smart Enterprises program - 18 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete all the following courses - 18 semester hours:

- ISEM 705 - Advanced Design Project (3 semester hours)
- ISEM 600-700 level course (3 semester hours)
- Any other graduate course (12 semester hours)

Recommended Sequence for the One-Year Advanced Studies in Smart Enterprises Program

The sequence that appears below is based upon the availability of specific courses each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- 500-600 Level Elective (3 semester hours)
- 500-600 Level Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- 600-700 Level ISEM Course (3 semester hours)
- 500-600 Level Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- ISEM 705 - Advanced Design Project (3 semester hours)
- 500-700 Level Elective (3 semester hours)

Total Semester Hours: 6

M.S. Learning Technologies and Media Systems

The Learning Technologies and Media Systems is a 36-semester hour program that provides the student with leading-edge approaches and skills to aid in the application of existing and emerging learning technologies in a variety of learning environments. The innovative applied learning technologies program provides the student with immediate career benefits while preparing for anticipated industry needs. The LTMS program supports learning outcome advancements in business and education by cultivating learning leaders with a foundation in instructional design, learning theory, technology application, an understanding of critical issues and an advanced vision for technology-supported learning.

Program Goals

LTMS graduates are able to:

- Analyze performance improvement opportunities to determine appropriate solutions;
- Create engaging learning solutions to improve performance;
- Evaluate the effectiveness and efficiency of learning solutions; and,
- Achieve the management of knowledge through digital communication.

Learning Technologies and Media Systems Requirements

The following courses comprise the Learning Technologies and Media Systems program - 36 semester hours. There are 15 semester hours of required core courses, 15 semester hours of open electives or concentration-based electives and 6 semester hours of an experiential component. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 15 semester hours:

- LTMS 500 - Macro Instructional Design (3 semester hours)
- LTMS 510 - Learning Technologies and Solutions (3 semester hours)
- LTMS 514 - Media Selection, Design and Production (3 semester hours)
- LTMS 518 - eLearning Development (3 semester hours)
- LTMS 525 - Learning Theories and Instructional Strategies (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- LTMS 698 - Learning Technologies Internship (1 to 6 semester hours)
  or
- LTMS 699 - Applied Project in LTMS (3 semester hours)

Complete the following Concentration:

Individualized Concentration (15 semester hours)

The Learning Technologies and Media Systems student can choose courses totaling 15 semester hours from any of the Master of Science programs.

Learning Technologies and Media Systems, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Learning Technologies and Media Systems Program

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- LTMS 500 - Macro Instructional Design (3 semester hours)
- LTMS 510 - Learning Technologies and Solutions (3 semester hours)

Total Semester Hours: 6

Spring Semester

- LTMS 514 - Media Selection, Design and Production (3 semester hours)
- LTMS 525 - Learning Theories and Instructional Strategies (3 semester hours)

Total Semester Hours: 6

Summer Semester

- LTMS 518 - eLearning Development (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- GRAD 695 - Research Methodology and Writing (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- LTMS 698 - Learning Technologies Internship (1 to 6 semester hours)
  or
- LTMS 699 - Applied Project in LTMS (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- Concentration Elective (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Pennsylvania Department of Education Instructional Certificate Program in Instructional Technology K - 12

The 24-semester hour graduate program in Instructional Technology prepares the student for the Pennsylvania Department of Education's instructional certificate in instructional technology K -12. A student may complete this program as a non-degree graduate student or as a Master of Science degree-seeking student.

Complete all of the following courses - 24 semester hours:

- LTMS 500 - Macro Instructional Design (3 semester hours)
- LTMS 510 - Learning Technologies and Solutions (3 semester hours)
- LTMS 514 - Media Selection, Design and Production (3 semester hours)
- LTMS 518 - eLearning Development (3 semester hours)
- LTMS 525 - Learning Theories and Instructional Strategies (3 semester hours)
- LTMS 530 - Managing Technology Resources (3 semester hours)
- LTMS 615 - Coordinating the Learning Technology Infrastructure (3 semester hours)
- LTMS 697 - LTMS ePortfolio (0 semester hour)
- LTMS 698 - Learning Technologies Internship (1 to 6 semester hours) (3)

Certificate in Instructional Design

This 15-semester hour certificate program in Instructional Design prepares the student with the skills, knowledge, and abilities needed to succeed in a career in the training industry. A student may complete this program as a non-degree graduate student or as a Master of Science degree-seeking student.

Complete all of the following courses - 15 semester hours:

- LTMS 500 - Macro Instructional Design (3 semester hours)
- LTMS 518 - eLearning Development (3 semester hours)
- LTMS 520 - Learning Evaluation and Assessment (3 semester hours)
- LTMS 531 - Designing Serious Games and Simulations (3 semester hours)

- LTMS 525 - Learning Theories and Instructional Strategies (3 semester hours)
  or
- LTMS 540 - The Instructional Designer as Entrepreneur (3 semester hours)

M.S. Next Generation Technologies

This 36-semester hour Master of Science degree in Next Generation Technologies concentrates on next generation of technologies that could cause major disruptions in the way we live and work. Blockchain technology is the focus of this program at present because it is recognized worldwide as a serious disruptive force in history of money as well as ledger technologies. In a short period, hundreds and thousands of blockchains have emerged to address multiple problems in financial, business, social, and even political arenas.

Program Goals

The student graduating with a Master of Science in Next Generation Technologies program will be able to:

- Recognize the necessity for conducting theoretical and empirical analysis;
- Adapt to rapidly changing technology, advanced learning, and entrepreneurship qualities; and,
- Master Blockchain as one specific type of disruptive technology.

Next Generation Technologies Requirements

The following courses comprise the Master of Science in Next Generation Technologies - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses (15 semester hours)

Complete all of the following courses - 12 semester hours:

- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)

- ISEM 515 - Commercialization of New Technologies (3 semester hours)
  or
- ISEM 528 - Industry Analysis and Technology Patterns (3 semester hours)

- ISEM 540 - Enterprise Architecture and Integration (3 semester hours)
- NGEN 585 - Principles of Software Architectural Patterns (3 semester hours)

Complete one of the following courses - 3 semester hours:

- ANLY 500 - Analytics I: Principles and Applications (3 semester hours)
- CISC 504 - Principles of Programming Languages (3 semester hours)
- CISC 595 - Software Architectural Patterns Design and Implementation (3 semester hours)
- CISC 610 - Data Structures and Algorithms (3 semester hours)
- ISEM 501 - Introduction to Digital Technologies (3 semester hours)
- PMGT 510 - Principles of Project Management (3 semester hours)
- Any other graduate core course (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- GRAD 699 - Graduate Thesis (3 semester hours)

or

- NGEN 699 - Applied Project in Next Generation Technologies (3 semester hours)

Complete the following Concentration:

Blockchain Concentration (15 semester hours)

Complete 15 semester hours from the following courses:

- NGEN 520 - Foundations of Blockchain (3 semester hours)
- NGEN 525 - Cryptocurrency and Regulation (3 semester hours)
- NGEN 534 - Ethereum Blockchain (3 semester hours)
- NGEN 540 - Blockchain Scalability (3 semester hours)
- NGEN 545 - Industry Blockchain and Blockchain-as-a-Service (3 semester hours)
- NGEN 560 - Decentralized Finance (3 semester hours)

Next Generation Technologies, Blockchain Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Next Generation Technologies Program with a Blockchain Concentration

The sequence that appears below is based upon the availability of specific courses each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)
- NGEN 520 - Foundations of Blockchain (3 semester hours)

Total Semester Hours: 6

Spring Semester

- ISEM 540 - Enterprise Architecture and Integration (3 semester hours)
- NGEN 525 - Cryptocurrency and Regulation (3 semester hours)

Total Semester Hours: 6

Summer Semester

- ISEM 515 - Commercialization of New Technologies (3 semester hours)
  or
- ISEM 528 - Industry Analysis and Technology Patterns (3 semester hours)
- NGEN 585 - Principles of Software Architectural Patterns (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- Core Elective (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- GRAD 695 - Research Methodology and Writing (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- NGEN 699 - Applied Project in Next Generation Technologies (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

M.S. Nursing

The 36-semester hour Master of Science degree in Nursing consists of advanced training in evidence-based practices, quality improvement, process improvement, and best practices in nursing education. The program is designed to support improvements and innovations in nursing for the current American healthcare system. Course offerings in this program will give students a broad understanding of diverse topics in current trends in nursing. These include the promotion of evidence-based practice, the strengthening of interprofessional communication, and an overall mindset of professional development. The program will prepare nurses for careers in clinical and non-clinical healthcare settings.

Additional Requirements for Admission to the MS in Nursing

The following are requirements in addition to those that are part of the general graduate admissions requirements:

- Completion of a bachelor's degree in Nursing
- Transcripts from school that shows BSN Degree Completion
- Two Letters of Recommendation
- Current United States issued RN License Number

Program Goals

A successful student of the program gains the following skills (vary according to the degree/concentration taken):

- Demonstrate Collaboratory practice expected of all healthcare professionals;
- Produce a life-long learning plan specific to career advancement and maintaining credentials;
- Utilize evidence-based research to guide healthcare clinical and operation decisions;
- Design and evaluate frameworks required to implement healthcare initiatives; and
- Adhere to regulatory practices associated with the healthcare industry.

Nursing Requirements

The following courses comprise the Master of Science in Nursing - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 18 semester hours:

- HCIN 500 - Healthcare Informatics (3 semester hours)
- NURS 510 - Foundational Concepts for Master Prepared Nurses (3 semester hours)
- NURS 515 - Quality and Safety (3 semester hours)
- NURS 520 - Healthcare Policy (3 semester hours)
- NURS 540 - Advanced Research Methods and Evidenced-Based Practices (3 semester hours)
- NURS 550 - Advanced Pathophysiology/Pharmacology and Health Assessment (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- NURS 695 - Nursing Practicum I (3 semester hours)
- NURS 699 - Nursing Practicum II (3 semester hours)

Complete one of the following Concentrations:

Two Concentrations are offered:

- Clinical Nurse Leader (12 semester hours)
- Nurse Educator (12 semester hours)

Clinical Nurse Leader Concentration (12 semester hours)

Complete the following courses - 12 semester hours:

- NURS 605 - Foundations for the Clinical Nurse Leader I (3 semester hours)
- NURS 610 - Foundations for Clinical Nurse Leader II (3 semester hours)
- NURS 630 - Epidemiology in Action: Tracking Health & Disease (3 semester hours)
- NURS 635 - Clinical Nurse Leader Evaluation of Health Outcomes (3 semester hours)

Nurse Educator Concentration (12 semester hours)

Complete the following courses - 12 semester hours:

- NURS 620 - Theoretical Foundation in Nursing Education (3 semester hours)
- NURS 625 - Curriculum Development (3 semester hours)
- NURS 640 - Nursing Research and Evidence-Based Teaching Models (3 semester hours)
- NURS 645 - Assessment and Evaluation in Education (3 semester hours)

Nursing, Clinical Nurse Leader Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Nursing Program with a Clinical Nurse Leader Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall

- NURS 510 - Foundational Concepts for Master Prepared Nurses (3 semester hours)
- NURS 520 - Healthcare Policy (3 semester hours)

Total Semester Hours: 6

Spring

- HCIN 500 - Healthcare Informatics (3 semester hours)
- NURS 515 - Quality and Safety (3 semester hours)

Total Semester Hours: 6

Summer

- NURS 540 - Advanced Research Methods and Evidenced-Based Practices (3 semester hours)
- NURS 550 - Advanced Pathophysiology/Pharmacology and Health Assessment (3 semester hours)

Total Semester Hours: 6

Second Year

Fall

- NURS 605 - Foundations for the Clinical Nurse Leader I (3 semester hours)
- NURS 630 - Epidemiology in Action: Tracking Health & Disease (3 semester hours)

Total Semester Hours: 6

Spring

- NURS 610 - Foundations for Clinical Nurse Leader II (3 semester hours)
- NURS 695 - Nursing Practicum I (3 semester hours)

Total Semester Hours: 6

Summer

- NURS 635 - Clinical Nurse Leader Evaluation of Health Outcomes (3 semester hours)
- NURS 699 - Nursing Practicum II (3 semester hours)

Total Semester Hours: 6

Nursing, Clinical Nurse Leader Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Nursing Program with a Clinical Nurse Leader Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

Session 1

- NURS 510 - Foundational Concepts for Master Prepared Nurses (3 semester hours)

Session 2

- NURS 515 - Quality and Safety (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- HCIN 500 - Healthcare Informatics (3 semester hours)

Session 2

- NURS 520 - Healthcare Policy (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- NURS 540 - Advanced Research Methods and Evidenced-Based Practices (3 semester hours)

Session 2

- NURS 550 - Advanced Pathophysiology/Pharmacology and Health Assessment (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

Session 1

- NURS 605 - Foundations for the Clinical Nurse Leader I (3 semester hours)

Session 2

- NURS 610 - Foundations for Clinical Nurse Leader II (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- NURS 630 - Epidemiology in Action: Tracking Health & Disease (3 semester hours)

Session 2

- NURS 635 - Clinical Nurse Leader Evaluation of Health Outcomes (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- NURS 695 - Nursing Practicum I (3 semester hours)

Session 2

- NURS 699 - Nursing Practicum II (3 semester hours)

Total Semester Hours: 6

Nursing, Nurse Educator Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Nursing Program with a Nurse Educator Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall

- NURS 510 - Foundational Concepts for Master Prepared Nurses (3 semester hours)
- NURS 520 - Healthcare Policy (3 semester hours)

Total Semester Hours: 6

Spring

- HCIN 500 - Healthcare Informatics (3 semester hours)
- NURS 515 - Quality and Safety (3 semester hours)

Total Semester Hours: 6

Summer

- NURS 540 - Advanced Research Methods and Evidenced-Based Practices (3 semester hours)
- NURS 550 - Advanced Pathophysiology/Pharmacology and Health Assessment (3 semester hours)

Total Semester Hours: 6

Second Year

Fall

- NURS 620 - Theoretical Foundation in Nursing Education (3 semester hours)
- NURS 625 - Curriculum Development (3 semester hours)

Total Semester Hours: 6

Spring

- NURS 640 - Nursing Research and Evidence-Based Teaching Models (3 semester hours)
- NURS 695 - Nursing Practicum I (3 semester hours)

Total Semester Hours: 6

Summer

- NURS 645 - Assessment and Evaluation in Education (3 semester hours)
- NURS 699 - Nursing Practicum II (3 semester hours)

Total Semester Hours: 6

Nursing, Nurse Educator Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Nursing Program with a Nurse Educator Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

Session 1

- NURS 510 - Foundational Concepts for Master Prepared Nurses (3 semester hours)

Session 2

- NURS 515 - Quality and Safety (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- HCIN 500 - Healthcare Informatics (3 semester hours)

Session 2

- NURS 520 - Healthcare Policy (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- NURS 540 - Advanced Research Methods and Evidenced-Based Practices (3 semester hours)

Session 2

- NURS 550 - Advanced Pathophysiology/Pharmacology and Health Assessment (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

Session 1

- NURS 620 - Theoretical Foundation in Nursing Education (3 semester hours)

Session 2

- NURS 625 - Curriculum Development (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- NURS 640 - Nursing Research and Evidence-Based Teaching Models (3 semester hours)

Session 2

- NURS 645 - Assessment and Evaluation in Education (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- NURS 695 - Nursing Practicum I (3 semester hours)

Session 2

- NURS 699 - Nursing Practicum II (3 semester hours)

Total Semester Hours: 6

M.S. Pharmaceutical Sciences

This 36-semester hour Master of Science degree program in Pharmaceutical Sciences at Harrisburg University consists of advanced training in characterizing drug action and disposition. Courses offered in this program will give the student a broad understanding of diverse topics in pharmaceutical science that range from established paradigms to emerging technology and applications. Scientific communication and professional development are stressed in the curriculum and reinforced through coursework and independent study. Graduates may seek a career in research, industry, or continuing to a doctoral program in health sciences or healthcare. Classes that focus on genomics and biopharmaceutics will give the student perspectives on aspects of personalized medicine. This diverse curriculum will prepare graduates for careers in the expanding personalized medicine and biotechnology sectors, as well as in more traditional roles in the pharmaceutical industry. The elective options allow the student to individualize their own coursework based on their career goals.

Additional Requirements for Admission to the MS in Pharmaceutical Sciences

The following are requirements in addition to those that are part of the general graduate admissions requirements:

- Bachelor's degree in a biological or life science
- Minimum GPA: 3.2
- Undergraduate academic requirements by content area:
    - Organic Chemistry: 8 credit hours
    - General Chemistry: 4 credit hours
    - General Biology: 4 credit hours
    - General Physics: 4 credit hours
    - Precalculus or higher math: 3 credit hours

Program Goals

Graduates of the Master of Science in Pharmaceutical Sciences program will be able to:

- Analyze the role of core content areas in pharmaceutical science in the industrial, clinical, and regulatory spheres;
- Recommend and apply established models to predict drug dispositions in patients as part of a multidisciplinary team;
- Design strategies using scientific approaches to accomplish set pharmaceutical goals in an industry or regulatory setting;
- Evaluate primary literature relevant to pharmaceutical sciences and use that literature to solve diverse problems in pharmaceutical science; and,
- Effectively communicate pharmaceutical science information and issues from around the world, orally and written, to individuals with scientific and non-scientific backgrounds.

Pharmaceutical Sciences Requirements

The following courses comprise the Master of Science in Pharmaceutical Sciences - 36 semester hours. The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 18 semester hours:

- BTEC 625 - Pharmacogenomics (3 semester hours)
- BTEC 635 - Clinical Pharmacology (3 semester hours)

- PHAR 520 - Pharmacokinetics and Pharmacodynamics (3 semester hours)
- PHAR 525 - Drug Transport (3 semester hours)
- PHAR 540 - Drug Metabolism (3 semester hours)
- PHAR 690 - Ethics and Trends in Pharmaceutical Science (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- PHAR 699 - Applied Project in Pharmaceutical Sciences (3 semester hours)

Complete 12 semester hours from the following courses:

- BTEC 508 - Omics for Life Sciences (3 semester hours)
- BTEC 540 - Biostatistics (3 semester hours)
- BTEC 610 - Advanced Topics in Drug Discovery and Delivery (3 semester hours)
- BTEC 612 - Regulatory Affairs in Life Science Industries (3 semester hours)
- BTEC 634 - Healthcare Economics: Fundamentals for Providers and Biotech Professionals (3 semester hours)
- MATH 510 - Applied Statistical Methods (3 semester hours)

Pharmaceutical Sciences Sequence

Recommended Sequence for the Two-Year Master of Science in Pharmaceutical Sciences

The sequence that appears below is based upon the availability of specific courses each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- PHAR 520 - Pharmacokinetics and Pharmacodynamics (3 semester hours)
- BTEC 635 - Clinical Pharmacology (3 semester hours)

Total Semester Hours: 6

Spring Semester

- BTEC 625 - Pharmacogenomics (3 semester hours)
- PHAR 540 - Drug Metabolism (3 semester hours)

Total Semester Hours: 6

Summer Semester

- PHAR 525 - Drug Transport (3 semester hours)

- Elective (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- Elective (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- GRAD 695 - Research Methodology and Writing (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- PHAR 699 - Applied Project in Pharmaceutical Sciences (3 semester hours)
- PHAR 690 - Ethics and Trends in Pharmaceutical Science (3 semester hours)

Total Semester Hours: 6

M.S. Project Management

The 36-semester hour graduate program in Project Management provides each student with a focused, applied and rigorous experience in creating, developing, implementing and assessing projects and the resulting products. To produce a high-quality product or service on time and to the specifications of a client, the skills and knowledge of a typical subject matter expert are not enough. The complexities of modern product development and project management require a professional with specific technical knowledge with strong project management and leadership skills. This program of study leads to a Master of Science degree that prepares the student for career advancement in the field of project management and for positions such as project manager, project coordinator, lead project engineer, enterprise project manager or information technology project manager.

Program Goals

PMGT graduates are able to:

- Demonstrate the applied knowledge and technical expertise in the management of a single project to meet stakeholder needs within constraints and aligned with traditional project management frameworks with industry standard artifacts;
- Demonstrate the applied knowledge and technical expertise in the management of a single team to meet stakeholder needs within constraints and aligned with agile project management frameworks with industry best practices;
- Demonstrate professional behavior by showing how successful project management will use stakeholder engagement, communication, leadership, and teamwork that is ethical, and culturally aware; and,
- Demonstrate strategic financial and organizational contextual awareness and insight by linking key stakeholder objectives to sustainable competitive strategies required to deliver value across operational functions using traditional and agile techniques.

Project Management Requirements

Master of Science in Project Management program is a 36-semester hour program that consists of required core courses (18 semester hours), required project or thesis courses (6 semester hours), and electives from a wide range of management and technology courses (12 semester hours). The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 18 semester hours:

- MGMT 520 - Professional Communication (3 semester hours)
- MGMT 560 - Organizational Leadership (3 semester hours)
- PMGT 510 - Principles of Project Management (3 semester hours)
- PMGT 530 - Risk, Procurement and Contracts (3 semester hours)
- PMGT 540 - Planning and Executing Projects (3 semester hours)
- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)
  and
- GRAD 699 - Graduate Thesis (3 semester hours)

  or

- PMGT 695 - Applied Project Management I (3 semester hours)
  and
- PMGT 699 - Applied Project Management II (3 semester hours)

Complete one of the following Concentrations:

Four Concentrations are offered:

- Individualized (12 semester hours)
- Agile Lean (12 semester hours)
- Biotechnology (12 semester hours)
- Human-Centered Interaction Design (12 semester hours)

**The student can choose a course from any of the Master of Science programs.*

Individualized Concentration (12 semester hours)

The Master of Science in Project Management student can choose courses totaling 12 semester hours from any graduate-level program. This option allows Project Management students to build their own customized specialization and concentrations.

Agile Lean Concentration (12 semester hours)

Complete the following courses - 12 semester hours:

- PMGT 572 - Agile Scrum Applied Projects (3 semester hours)
  or
- PMGT 573 - Scaling Agile for the Enterprise (3 semester hours)

- PMGT 574 - Lean Thinking (3 semester hours)
- PMGT 576 - Agile Lean Transformational Leadership (3 semester hours)
- Elective (3 semester hours)*

Biotechnology Concentration (12 semester hours)

Complete 12 semester hours from the following courses:

- BTEC 502 - Biomaterials (3 semester hours)
- BTEC 508 - Omics for Life Sciences (3 semester hours)
- BTEC 522 - Graduate Biotechnology Seminar (3 semester hours)
- BTEC 540 - Biostatistics (3 semester hours)
- BTEC 550 - Instrumentation in Biotechnology Industry (3 semester hours)
- BTEC 560 - Design of Experiment (3 semester hours)
- BTEC 610 - Advanced Topics in Drug Discovery and Delivery (3 semester hours)
- BTEC 612 - Regulatory Affairs in Life Science Industries (3 semester hours)
- BTEC 615 - Biomedical Devices and Prototyping (3 semester hours)
- BTEC 618 - Principles of Bioprocessing (3 semester hours)
- BTEC 620 - Emerging Trends in Diagnostics (3 semester hours)

- BTEC 622 - Principles of Accounting and Finance (3 semester hours)
- BTEC 625 - Pharmacogenomics (3 semester hours)
- BTEC 630 - Cancer Biotechnology (3 semester hours)
- BTEC 634 - Healthcare Economics: Fundamentals for Providers and Biotech Professionals (3 semester hours)
- BTEC 635 - Clinical Pharmacology (3 semester hours)
- BTEC 640 - Trends in Regenerative Medicine (3 semester hours)
- BTEC 650 - Fermentation Technologies (3 semester hours)
- BTEC 655 - Industrial Enzymes and Proteins (3 semester hours)
- BTEC 672 - Legal Affairs and Policies for Life Science Industry (3 semester hours)
- BTEC 675 - Innovation and Improvisation in Research and Development (3 semester hours)
- BTEC 698 - Biotechnology Graduate Internship (3 semester hours)

Human-Centered Interaction Design Concentration (12 semester hours)

Complete the following courses - 12 semester hours:

- HCID 500 - Design Perspectives (3 semester hours)
- HCID 504 - Qualitative Discovery Research (3 semester hours)
- HCID 510 - Theories of Human Interaction (3 semester hours)
- HCID 520 - Users and Populations (3 semester hours)

Project Management, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Project Management with the Individualized Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- PMGT 510 - Principles of Project Management (3 semester hours)
- MGMT 520 - Professional Communication (3 semester hours)

Total Semester Hours: 6

Spring Semester

- PMGT 540 - Planning and Executing Projects (3 semester hours)
- MGMT 560 - Organizational Leadership (3 semester hours)

Total Semester Hours: 6

Summer Semester

- PMGT 530 - Risk, Procurement and Contracts (3 semester hours)
- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- GRAD 695 - Research Methodology and Writing (3 semester hours)
  or
- PMGT 695 - Applied Project Management I (3 semester hours)

- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- Concentration Electives (6 semester hours)

Total Semester Hours: 6

Summer Semester

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- PMGT 699 - Applied Project Management II (3 semester hours)
- Concentration Elective (3 semester hours)

Total Semester Hours: 6

Project Management, Agile Lean Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Project Management Program with a concentration in Agile Lean

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- PMGT 510 - Principles of Project Management (3 semester hours)
- MGMT 520 - Professional Communication (3 semester hours)

Total Semester Hours: 6

Spring Semester

- PMGT 540 - Planning and Executing Projects (3 semester hours)
- MGMT 560 - Organizational Leadership (3 semester hours)

Total Semester Hours: 6

Summer Semester

- PMGT 530 - Risk, Procurement and Contracts (3 semester hours)
- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- GRAD 695 - Research Methodology and Writing (3 semester hours)
  or
- PMGT 695 - Applied Project Management I (3 semester hours)

- PMGT 574 - Lean Thinking (3 semester hours)

Total Semester Hours: 6

Spring Semester

- PMGT 572 - Agile Scrum Applied Projects (3 semester hours)
  or
- PMGT 573 - Scaling Agile for the Enterprise (3 semester hours)

- Concentration Elective (3 semester hours)
  PMGT 572 or PMGT 573 recommended *(select the course not previously chosen for Concentration requirement)*

Total Semester Hours: 6

Summer Semester

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- PMGT 699 - Applied Project Management II (3 semester hours)
- PMGT 576 - Agile Lean Transformational Leadership (3 semester hours)

Total Semester Hours: 6

Project Management, Agile Lean Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Project Management Program with a concentration in Agile Lean

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

Session 1

- PMGT 510 - Principles of Project Management (3 semester hours)

Session 2

- MGMT 520 - Professional Communication (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- PMGT 540 - Planning and Executing Projects (3 semester hours)

Session 2

- MGMT 560 - Organizational Leadership (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)

Session 2

- PMGT 530 - Risk, Procurement and Contracts (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

Session 1

- PMGT 574 - Lean Thinking (3 semester hours)

Session 2

- GRAD 695 - Research Methodology and Writing (3 semester hours)
  or
- PMGT 695 - Applied Project Management I (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- PMGT 572 - Agile Scrum Applied Projects (3 semester hours)
  or
- PMGT 573 - Scaling Agile for the Enterprise (3 semester hours)

Session 2

- Concentration Elective (3 semester hours)

PMGT 572 or PMGT 573 recommended (*select the course not previously chosen for Concentration requirement*)

Total Semester Hours: 6

Summer Semester

Session 1

- PMGT 576 - Agile Lean Transformational Leadership (3 semester hours)

Session 2

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- PMGT 699 - Applied Project Management II (3 semester hours)

Total Semester Hours: 6

Project Management, Biotechnology Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Project Management Program with a Biotechnology Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall

- MGMT 520 - Professional Communication (3 semester hours)
- PMGT 510 - Principles of Project Management (3 semester hours)

Total Semester Hours: 6

Spring

- MGMT 560 - Organizational Leadership (3 semester hours)
- PMGT 540 - Planning and Executing Projects (3 semester hours)

Total Semester Hours: 6

Summer

- PMGT 530 - Risk, Procurement and Contracts (3 semester hours)
- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)

Total Semester Hours: 6

Second Year

Fall

- GRAD 695 - Research Methodology and Writing (3 semester hours)
  or
- PMGT 695 - Applied Project Management I (3 semester hours)

- Biotechnology Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring

- Biotechnology Concentration Electives (6 semester hours)

Total Semester Hours: 6

Summer

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- PMGT 699 - Applied Project Management II (3 semester hours)

- Biotechnology Concentration Elective (3 semester hours)

Total Semester Hours: 6

Project Management, Biotechnology Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Project Management Program with a Biotechnology Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

Session 1

- PMGT 510 - Principles of Project Management (3 semester hours)

Session 2

- Biotechnology Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- PMGT 540 - Planning and Executing Projects (3 semester hours)

Session 2

- Biotechnology Concentration Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- MGMT 520 - Professional Communication (3 semester hours)

Session 2

- PMGT 530 - Risk, Procurement and Contracts (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

Session 1

- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)

Session 2

- Biotechnology Concentration Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

Session 1

- GRAD 695 - Research Methodology and Writing (3 semester hours)
  or
- PMGT 695 - Applied Project Management I (3 semester hours)

Session 2

- MGMT 560 - Organizational Leadership (3 semester hours)

Total Semester Hours: 6

Summer Semester

Session 1

- Biotechnology Concentration Elective (3 semester hours)

Session 2

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- PMGT 699 - Applied Project Management II (3 semester hours)

Total Semester Hours: 6

Project Management, Human-Centered Interaction Design Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Project Management with the Human-Centered Interaction Design Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- PMGT 510 - Principles of Project Management (3 semester hours)
- MGMT 520 - Professional Communication (3 semester hours)

Total Semester Hours: 6

Spring Semester

- PMGT 540 - Planning and Executing Projects (3 semester hours)
- MGMT 560 - Organizational Leadership (3 semester hours)

Total Semester Hours: 6

Summer Semester

- PMGT 530 - Risk, Procurement and Contracts (3 semester hours)
- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- GRAD 695 - Research Methodology and Writing (3 semester hours)
  or
- PMGT 695 - Applied Project Management I (3 semester hours)

- HCID 500 - Design Perspectives (3 semester hours)

Total Semester Hours: 6

Spring Semester

- HCID 504 - Qualitative Discovery Research (3 semester hours)
- HCID 510 - Theories of Human Interaction (3 semester hours)

Total Semester Hours: 6

Summer Semester

- HCID 520 - Users and Populations (3 semester hours)

- GRAD 699 - Graduate Thesis (3 semester hours)
  or
- PMGT 699 - Applied Project Management II (3 semester hours)

Total Semester Hours: 6

Certificate in Project Management

This 18-semester hour program is designed for an individual with a goal of a certificate in Project Management and an industry certification from the Project Management Institute [either Project Management Professional (PMP), or Certified Associate Project Manager (CAPM)]. The certificate in Project Management program requires 18 semester hours in Project Management, a non-credit PMP preparation course, and the successful completion of the PMP exam or CAPM exam. A student may complete this program as a non-degree graduate student or as a Master of Science degree-seeking student. The student has one year following the completion of the coursework to take the PMP exam.

Complete all of the following courses - 18 semester hours:

- MGMT 520 - Professional Communication (3 semester hours)
- MGMT 560 - Organizational Leadership (3 semester hours)
- PMGT 510 - Principles of Project Management (3 semester hours)
- PMGT 530 - Risk, Procurement and Contracts (3 semester hours)
- PMGT 540 - Planning and Executing Projects (3 semester hours)
- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)
- PMGT 697 - PMP/CAPM Exam Preparation (0 semester hour)

Certificate in Agile Lean

This 12-semester hour certificate program is designed for the student with a desire to understand the principles and practices of Agile Lean. The student will be provided with a thorough understanding and application of Agile Lean frameworks used in the project management and product development domains. Starting with an Agile Project Management with Scrum course, the certificate then expands to include an experiential course of applying Scrum to actual projects, conducting new product development with Agile Lean, and leading Agile Lean transformations in organizations. The certificate in Agile Lean requires 12 semester hours in Agile Lean and successfully complete (pass) one or more industry certifications (i.e., PSM I - Professional Scrum Master or PSPO - Professional Scrum Product Owner from Scrum.org., or similar certification). A student may complete this program as a non-degree graduate student or as a Master of Science degree-seeking student.

Complete all of the following courses - 12 semester hours:

- PMGT 570 - Agile Project Management with Scrum Methodology (3 semester hours)
- PMGT 572 - Agile Scrum Applied Projects (3 semester hours)
  or
- PMGT 573 - Scaling Agile for the Enterprise (3 semester hours)
- PMGT 574 - Lean Thinking (3 semester hours)
- PMGT 576 - Agile Lean Transformational Leadership (3 semester hours)

M.S. Techpreneurship

This 36-semester hour Master of Science in Techpreneurship combines technology, innovation, and entrepreneurship. The student explores the skillsets to build start-ups or innovate new products or processes in an existing organization. The student is taught to create, recognize, and support innovation in any environment. The student is introduced to the process technologies entrepreneurs use to start and scale high growth companies. Techpreneurship is a flexible program that allows the student to choose elective courses from any existing graduate program to leverage their previous education and work experience. This program provides access to a network of practicing mentors who may share their experiences and provide guidance to the student.

Program Goals

Techpreneurship graduates are able to:

- Start, own, and manage successful innovative and technology-intensive startup businesses;
- Embrace innovation to capitalize economic benefits and to serve as a positive factor in social change;
- Leverage modern technologies to gain a competitive advantage in the business world;
- Become leaders and effective members of the business community; and
- Develop communication skills and the ability to interact with others.

Techpreneurship Requirements

Master of Science in Techpreneurship program is a 36-semester hour program that consists of required core courses (15 semester hours), required project or thesis courses (6 semester hours), and electives from a wide range of management and technology courses (15 semester hours). The semester hour value of each course appears in parentheses ( ).

Complete the following Core courses - 15 semester hours:

- ENTP 500 - Entrepreneurship and Innovation (3 semester hours)
- ENTP 510 - Entrepreneurship: From Traction to Scale (3 semester hours)
- ENTP 520 - Economics of Innovation (3 semester hours)
- ENTP 530 - Financial Sustainability (3 semester hours)
- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)

Complete the following experiential courses - 6 semester hours:

- GRAD 695 - Research Methodology and Writing (3 semester hours)

- ENTP 699 - Applied Project in Techpreneurship (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)

Complete the following Concentration:

Individualized Concentration (15 semester hours)

The Master of Science in Techpreneurship student can choose courses totaling 15 semester hours from any Harrisburg University Master of Science program.

Techpreneurship, Individualized Concentration Sequence

Recommended Sequence for the Two-Year Master of Science in Techpreneurship with the Individualized Concentration

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- ENTP 500 - Entrepreneurship and Innovation (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Spring Semester

- ISEM 500 - Strategic Planning for Digital Transformation (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- ENTP 510 - Entrepreneurship: From Traction to Scale (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Second Year

Fall Semester

- ENTP 520 - Economics of Innovation (3 semester hours)
- GRAD 695 - Research Methodology and Writing (3 semester hours)

Total Semester Hours: 6

Spring Semester

- ENTP 530 - Financial Sustainability (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Summer Semester

- ENTP 699 - Applied Project in Techpreneurship (3 semester hours)
  or
- GRAD 699 - Graduate Thesis (3 semester hours)
- Elective (3 semester hours)

Total Semester Hours: 6

Certificate in Population Health Management

This 18-semester hour certificate program provides the student with the core knowledge needed to improve population focused solutions. This certificate provides an interdisciplinary teaching focus that not only teaches the needed methodologies of population health management but the application and evaluation of population health management. This practice-based coursework is designed to prepare individuals for what to expect when they enter the field as professionals and create opportunities to work among other local, national, and global leaders in public health. The student will learn to think critically in a challenging health environment and apply their knowledge to future work in academia, non-profits, hospitals, and government agencies. A student may complete this certificate program as a non-degree graduate student or a Master of Science degree-seeking student.

Program Goals

- Develop research and health informatics skills;
- Assess population health needs, assets, and capacities;
- Develop population health intervention, policy, or research plan;
- Develop leadership and management skills; and
- Communicate population health science to diverse audiences using a variety of communication tools and styles.

Population Health Management Certificate Requirements

Complete the following courses - 18 semester hours:

- PHSC 500 - Introduction to Population Health Management (3 semester hours)
- PHSC 510 - Social Determinants of Health and Health Equity (3 semester hours)
- PHSC 525 - Population Health Policy (3 semester hours)
- PHSC 540 - Population Health Research Informatics (3 semester hours)
- PHSC 550 - Approaches to Population Health Innovations (3 semester hours)
- PHSC 598 - Practicum in Population Health (3 semester hours)

Certificate in Population Health Management Sequence

Recommended Sequence for the Population Health Management Certificate

The sequence that appears below is based upon the availability of specific courses in each semester and the successful completion of course prerequisites.

First Year

Fall Semester

- PHSC 500 - Introduction to Population Health Management (3 semester hours)
- PHSC 510 - Social Determinants of Health and Health Equity (3 semester hours)
- PHSC 525 - Population Health Policy (3 semester hours)

Total Semester Hours: 9

Spring Semester

- PHSC 540 - Population Health Research Informatics (3 semester hours)
- PHSC 550 - Approaches to Population Health Innovations (3 semester hours)

Total Semester Hours: 6

Summer Semester

- PHSC 598 - Practicum in Population Health (3 semester hours)

Total Semester Hours: 3

Doctorate Academic Programs

Ph.D. Data Sciences

Doctorate education focuses on enabling the student to make original contributions to their respective fields of study. There are two phases of the doctoral program at HU: (1) a learning phase that includes coursework, seminars, research, and fieldwork that contributes to the student's knowledge in the program of study; and, (2) a research phase that focuses on student's original research culminating in his/her final examination. Upon a student's successful completion of all required course work, defense of the dissertation, and completion of all milestones, the student is awarded the doctoral degree in the program of study.

Mission Statement

The mission of the Harrisburg University Data Science Program is to create scientifically minded and technically proficient professionals with a comprehensive background in the methodological diversity of the data sciences and the intellectual depth to offer influential perspectives to analytical teams across disciplines.

Program Goals

The Data Sciences Program will produce Ph.D. graduates who:

- Will have applied diverse data science methodologies using a scientific process individually or in teams to provide impactful insights from large sets of data;
- Will have used effective communications to explain insights from analytical processes on data to diverse audiences; and,
- Will have grown professionally through self-study, continuing education, and professional development.

*Work experience is a requirement for successful applied learning during the full course of your degree program. If you are an F1 student, eligible CPT authorizations are required. If you are unable to work, you must submit a Waiver of Required Work Experience to your program lead.

Data Sciences Requirements

The following courses comprise the 36 semester hours required for the Ph.D. in Data Sciences. Each course listed represents a three-semester hour value. Details about each of the Milestones can be found in the Ph.D. Guidebook on the Records and Registration SharePoint Site (https://myharrisburgu.sharepoint.com/sites/Academics).

Complete 18 semester hours from the following upper-level courses:

- ANLY 705 - Modeling for Data Science (3 semester hours)
- ANLY 710 - Applied Experimental and Quasi-Experimental Design (3 semester hours)
- ANLY 715 - Applied Multivariate Data Analysis (3 semester hours)
- ANLY 720 - Data Science from an Ethical Perspective (3 semester hours)
- ANLY 725 - Research Seminar in Unstructured Data Analysis (3 semester hours)
- ANLY 730 - Research Seminar in Forecasting (3 semester hours)
- ANLY 735 - Research Seminar in Machine Learning (3 semester hours)
- ANLY 740 - Graph Theory (3 semester hours)
- ANLY 745 - Functional Programming Methods for Data Science (3 semester hours)

- ANLY 755 - Advanced Topics in Big Data (3 semester hours)

Complete 6 semester hours from the following Doctoral Research Seminars:

- ANLY 760 - Doctoral Research Seminar (6 semester hours)
- ANLY 761 - Research Seminar in Unstructured Data Analysis (3 semester hours)
- ANLY 762 - Research Seminar in Forecasting (3 semester hours)
- ANLY 763 - Research Seminar in Machine Learning (3 semester hours)

Comprehensive Examination to qualify for doctoral dissertation research work

Defend Dissertation Proposal

Complete 12 semester hours of ANLY 799-Doctoral Studies:

- ANLY 799 - Doctoral Studies (6 semester hours)

Defend the Dissertation

Ph.D. Computational Sciences

The Computational Sciences Ph.D. program is a multi-disciplinary, collaborative, and innovative initiative that promotes conducting research in science and technology. The program curriculum is designed around the intellectual skills needed in the rapidly changing character of research in the field and its applications in natural sciences. In addition, the program aims to help make researchers more competitive for external research funds, foster the development of cross-disciplinary and interdisciplinary research and scholarship, and expand graduate student enrollment in our graduate programs, in compliance with Harrisburg University's institutional mission statement and strategic plans.

Additional Requirement for Admission to the Ph.D. in Computational Sciences

The following is a requirement in addition to those that are part of the general doctoral admissions requirements:

- Master's degree in science or engineering disciplines with a strong background in applied mathematics, statistics, numerical analysis, simulation and modeling, and programming languages.

Mission Statement

The Ph.D. Computational Sciences Program is an academic, research-oriented graduate program that emphasizes multidisciplinary training in innovative research in computational components and systems of computer science and its applications in natural science disciplines. The program is intended for science and engineering students who need extensive use of large-scale computation, computational methods, or algorithms for advanced computer design architectures in their doctoral studies. A firm knowledge of scientific discipline method theory and practice is essential.

Program Goals

The Ph.D. Computational Sciences Program will produce graduates who:

- Perform independent, competitive scientific research;
- Utilization of the scientific method;
- Realize computational solutions to real-world problems;
- Make contributions to the discipline through disseminated results;
- Adhere to the ethical and moral obligations in all professional activities; and,
- Promote quality of life through local and global computing systems.

*Work experience is a requirement for successful applied learning during the full course of your degree program. If you are an F1 student, eligible CPT authorizations are required. If you are unable to work, you must submit a Waiver of Required Work Experience to your program lead.

Computational Sciences Requirements

The following courses comprise the 36 semester hours required for the Ph.D. in Computational Sciences. The semester hour value of each course appears in parentheses ( ). Additional details about Milestones can be found in the Ph.D. Guidebook on the Records and Registration SharePoint Site.

Complete 9 semester hours from the following doctoral Breadth courses:

- CISC 701 - Contemporary Computing Systems Architectures (3 semester hours)

- CISC 709 - Contemporary Computing Systems Programming (3 semester hours)
- CISC 719 - Contemporary Computing Systems Modeling (3 semester hours)

Complete 6 semester hours from the following doctoral Depth courses:

(A list of potential Computational Science Areas of Study is provided below)

- CISC 727 - Research Explorations in Computational Sciences I (3 semester hours)
- CISC 733 - Research Explorations in Computational Sciences II (3 semester hours)

Complete 3 semester hours of Research Symposium:

- CISC 777 - Research Symposium Paper (3 semester hours)

Complete 6 semester hours of Doctoral Research Seminar:

(specific to the area of research)

- CISC 787 - Doctoral Research Seminar I (3 to 6 semester hours)
- CISC 797 - Doctoral Research Seminar II (3 to 6 semester hours)

Complete 12 semester hours of Doctoral Dissertation:

- CISC 799 - Doctoral Dissertation (3 to 6 semester hours)

Potential Computational Science Areas of Study

Topics may include, but are not limited to:

- Automation of Intelligence
- Blockchain and Digital Ledger Technologies I
- Biology and Biotechnology
- Chemistry and Biochemistry
- Cybersecurity
- Computer Networks & High-Performance Data Transfer Protocols
- Distributed Systems, Mobile, and Cloud Computing
- Drug Discovery
- Energy and Climate Sciences
- Energy Engineering
- Environmental Science
- Forensics and Investigative Intelligence
- High Frequency Trading, Contract Networks, and Complex Decision Making
- Medical Devices and Healthcare Informatics
- Microprocessors and Embedded Systems
- Robotics and Autonomous Systems
- Social Science
- Systems and Software Standards

Ph.D. Information Systems Engineering and Management

Doctorate education focuses on enabling the student to make original contributions to their respective fields of study. There are two phases of the doctoral program at HU, an initial learning phase that can include coursework, seminars, research, and fieldwork that contributes to the student's knowledge in the program of study; and a second research phase that focuses on student's original research culminating in their final dissertation defense. Upon a student's defense of their dissertation as well as completion of all other milestones and graduate requirements, the student will be awarded the doctoral degree in their program of study.

Additional Requirements for Admission to the Ph.D. in Information Systems Engineering and Management

The following are requirements in addition to those that are part of the general doctoral admissions requirements:

- Minimum GPA: 3.30
- GRE score in the 65th percentile or above in the Quantitative portion
- Evidence of research potential. Such evidence could come from submission of a Master's Thesis (or equivalent published research). Students that are finishing the thesis may submit the incomplete thesis as part of their application packet. Students that have no published thesis or other research should have other means of showing potential, such as courses taken or significant documented projects.

Mission Statement

The mission of the Harrisburg University Information Systems Engineering and Management Ph.D. Program is to create information systems thinkers and leaders with the ability to add to the body of knowledge and practice in today's and tomorrow's academic, public and private organizations.

Program Goals

The Information Systems Engineering and Management program will produce Ph.D. graduates who:

- Create original knowledge and understanding by contributing new theories, concepts, or new applications of existing theories to a discipline or area of professional practice;
- Advance research efforts and disseminate results to peers and the community including conferences, journal outlets, and/or internal organizational formats; and,
- Integrate theories and concepts through critical reflection, synthesis, and interpretation for solutions of private, public, national, or global problems.

*Work experience is a requirement for successful applied learning during the full course of your degree program. If you are an F1 student, eligible CPT authorizations are required. If you are unable to work, you must submit a Waiver of Required Work Experience to your program lead.

Information Systems Engineering and Management Requirements

The following courses comprise the 36-48 semester hours required for the Ph.D. in Information Systems Engineering and Management. The semester hour value of each course appears in parentheses ( ). Details about Milestones can be found in the Ph.D. Guidebook on the Records and Registration SharePoint Site.

Complete 9 to 21 semester hours from the following graduate and doctoral Breadth courses:

(the number of semester hours required is based on the student's individual Plan of Study specified by the Admissions Committee):

- ISEM 503 - Artificial Intelligence Principles and Applications (3 semester hours)
- ISEM 530 - Systems Engineering Principles (3 semester hours)
- ISEM 540 - Enterprise Architecture and Integration (3 semester hours)
- ISEM 580 - Special Topics in Information Systems Engineering and Management (3 semester hours) (Special Topic: Introduction to Research Methods)
- ISEM 700 - Smart Enterprises and Strategic Intelligence (3 semester hours)
- ISEM 706 - Research Methods in Information Systems Engineering and Management (3 semester hours)
- ISEM 730 - Advanced Systems Engineering (3 semester hours)

Complete 9 semester hours from the following doctoral Depth courses:

- ISEM 705 - Advanced Design Project (3 semester hours)
- ISEM 710 - Knowledge Engineering (3 semester hours)
- ISEM 712 - Cyber-Physical Systems (3 semester hours)
- ISEM 715 - Systems Science (3 semester hours)
- ISEM 720 - Advanced Applications of Satellite Systems (3 semester hours)
- ISEM 725 - Advanced Business Process Modelling and Intelligence (3 semester hours)
- ISEM 735 - Advanced Applications of Machine Learning and Deep Learning (3 semester hours)
- ISEM 740 - Enterprise Engineering (3 semester hours)
- ISEM 745 - Research in Industry Analysis and Technology Patterns (3 semester hours)
- ISEM 750 - Simulation Modeling and Analysis (3 semester hours)
- ISEM 755 - Smart Cities, Societies, and Governments (3 semester hours)
- ISEM 760 - Advanced Topics in Operations Management (3 semester hours)
- ISEM 770 - Advanced Topics in ISEM (3 semester hours)
- MGMT 721 - Management Sciences I (3 semester hours)
- MGMT 722 - Management Sciences II (3 semester hours)
- MGMT 731 - Innovation and Entrepreneurship (3 semester hours)
- QISC 715 - Topics in Quantum Information Science (3 semester hours)

Complete the Doctoral Research Seminar:

6 semester hours of ISEM 780 and defense of dissertation proposal

Complete the dissertation process:

12 semester hours of ISEM 799 and defense of the dissertation

Course Descriptions

ANLY 500 - Analytics I: Principles and Applications

(3 semester hours)
Prerequisites: None
Description: The first course in analytics covers the core concepts and applications of analytics. The student is introduced to the main concepts and tools of analytics including descriptive, predictive, and prescriptive analytics. During the course, the student uses a variety of statistical and quantitative methods, computational tools, and predictive models to make data-driven decisions. By the end of the course, the student will apply the concepts to real work projects where, by asking some questions about an issue or situation, use analytical tools to respond to it, and present it to technical and layperson audiences.

ANLY 502 - Mathematical Foundations for Data Analysis

(3 semester hours)
Prerequisites: None
Description: This course reviews the fundamental mathematics required to be successful in the analytics program. It is designed to strengthen the mathematical abilities while addressing the requirements for coding/scripting. It presents the mathematical topics as coding/scripting problems. This is intended to further strengthen the ability to develop the subroutines/codes/scripts that are also necessary in an analytics career.

ANLY 505 - Data Simulation, Bayesian Modeling, and Inference

(3 semester hours)
Prerequisites: ANLY 500 and ANLY 502
Description: This course covers the basic principles of statistical modeling and inference. The course focuses on developing and fitting several types of regression models, multilevel models, and everything in between. Topics included in the class cover, prior predictive simulation, sampling from the posterior, interaction terms, covariance, information criteria, and Markov Chain Monte Carlo estimation. The course also covers measurement error, missing data, and Gaussian process models for spatial and network autocorrelation. This course outlines step-by-step calculations that would normally be automated in the modeling process. This approach ensures that the student understands the details of statistical modeling in order to make reasonable choices and interpretations of their own modeling work. The class utilizes interdisciplinary source material, Program R, and easy to understand metaphors to develop and interpret statistical models. The course's emphasis is on how Bayesian data analysis can be used for causal inference and predicting new data.

ANLY 506 - Exploratory Data Analysis

(3 semester hours)
Prerequisites: None
Description: Exploratory data analysis plays a crucial role in the initial stages of analytics. It comprises the pre-processing, cleaning, and preliminary examination of data. This course provides instruction in all aspects of exploratory data analysis. It reviews a wide variety of tools and techniques for pre-processing and cleaning data, including big data. It provides the student with practice in evaluating and plotting/graphing data to evaluate the content and integrity of a data set.

ANLY 510 - Analytics II: Principles and Applications

(3 semester hours)
Prerequisites: ANLY 500 and ANLY 502 or Consumer Behavior and Decision Sciences Major and Permission of Program Lead

Description: This course takes an applied perspective and provides the statistical tools and analytic thinking techniques needed to: formulate a clear hypothesis, determine the most efficient method to obtain required data, determine and apply the proper statistical techniques to the resulting data, and effectively convey the results to both experts and laypersons. The course begins with a review of the descriptive analytics concepts (i.e., sampling, and statistical inferences) introduced in ANLY 500 as well as general conventions regarding experimentation and research. It then progresses to predictive and prescriptive analytics techniques such as regression and forecasting that can be used to predict future events. Later sessions focus on issues related to lack of experimental control (e.g., quasi-experimental design and analysis). The course culminates with a research project in which the student applies the concepts learned to their own research interests.

ANLY 512 - Data Visualization

(3 semester hours)
Prerequisites: ANLY 500 or HCIN 500 or ISEM 542
Description: The visualization and communication of data is a core competency of analytics. This course takes advantage of the rapidly evolving tools and methods used to visualize and communicate data. Key design principles are used to reinforce skills in visual and graphical representation.

ANLY 515 - Risk Modeling and Assessment

(3 semester hours)
Prerequisites: ANLY 500
Description: This course focuses on risk management models and tools and the measurement of risk using statistical and stochastic methods, hedging, and diversification. Examples of this are insurance risk, financial risk, and operational risk. Topics covered include estimating rare events, extreme value analysis, time series estimation of external events, axioms of risk measures, hedging using financial options, credit risk modeling, and various insurance risk models.

ANLY 520 - Natural Language Processing

(3 semester hours)
Prerequisites: ANLY 500
Description: Web technologies based on text and Natural Language Processing (NLP) are becoming the backbone of analytic solutions for understanding language as text language processing has come to play a central role in the multilingual information society. This course provides a highly accessible introduction to the field of text analytics focusing on processing text, tokenization, entity recognition, classification, and sentiment analysis. The course is intensely practical, it uses R and Python programming languages to perform NLP tasks.

ANLY 525 - Quantitative Decision-Making

(3 semester hours)
Prerequisites: ANLY 510
Description: Decision-making in business today requires the use of all resources, particularly information. Analytics supports decision-making quantitatively by applying information received from multiple sources. This course provides the foundation for quantitative decision-making using a rational, coherent approach and includes decision-making principles and how they are applied to business challenges today.

ANLY 530 - Principles and Applications of Machine Learning

(3 semester hours)
Prerequisites: ANLY 510
Description: This course introduces the student to machine learning. It provides the student with the cognitive, mathematical and analytical foundation required for machine learning. It also provides the student with a broad

overview of machine learning, including topics from data mining, pattern recognition and supervised and unsupervised learning. This course prepares the student for the complex, higher-level topics in Machine Learning II.

ANLY 535 - Principles and Applications of Deep Learning

(3 semester hours)
Prerequisites: ANLY 530
Description: Machine Learning II considers complex, high-level topics in machine learning. It builds on the foundation provided by Machine Learning I to develop algorithms for supervised and unsupervised machine learning, to study and develop artificial neural networks, to study, develop and evaluate systems for pattern recognition and to consider trade-offs in models, for example, balancing complexity (e.g. volume, variety and velocity of big data) and performance.

ANLY 540 - Language Modeling

(3 semester hours)
Prerequisites: ANLY 500
Description: This course is an introduction to computational methods in empirical linguistic analysis and natural language processing focusing on building models of human language. Topics include vector space and topics models, similarity, deep learning, and information theory network models. This course will explore how to apply statistical techniques to language with a focus on R and Python programming skills.

ANLY 545 - Categorical Data Analysis

(3 semester hours)
Prerequisites: ANLY 502
Description: This course provides student with exposure to an expanded range of analytical methods. This includes additional functions, e.g. the logit function, additional distributions, e.g. Poisson distribution, and additional analysis techniques, e.g. those included in the study of discrete structures such as combinatorics. Particular attention is paid to analytics relevant to disciplines in the social sciences. Also included are survey design, development and (survey data) analysis.

ANLY 550 - Structural Equation Modeling

(3 semester hours)
Prerequisites: ANLY 500
Description: This course will cover an in-depth exploration of structural equation modeling (SEM). The student will learn the fundamental concepts of SEM and how to model different types of research questions, as well as interpretation of the implications of your model results. Path analysis, confirmatory factor analysis, and multi-group models will be several types of techniques covered. By the end of this course, the student will be able to analyze complex relationships between measured and latent variables.

ANLY 555 - Spatial Analytics

(3 semester hours)
Prerequisites: ANLY 500
Description: This course introduces spatially referenced data, how to analyze it, and the potential of geographical-based data analysis, using practical skills. Topics include descriptive data analysis, mapping methods, quantitative analysis, qualitative analysis, and introduction to geostatistics and spatial modeling. On the practical side, the student will be introduced to different software: R and GeoDa or ArcGIS for menu-driven application.

ANLY 560 - Advanced Programming for Data Analytics

(3 semester hours)
Prerequisites: None
Description: This course provides the student with the required knowledge and skills to handle and analyze data using a variety of programming languages as well as a variety of programming tools and methods. Depending on current industry standards, the student will be provided with the opportunity to develop knowledge and skills in programming environments such as R, Octave, and Python. In addition, the student is introduced to current industry standard data analysis packages and tools such as those in Matlab, SAS or SPSS.

ANLY 565 - Time Series and Forecasting

(3 semester hours)
Prerequisites: None
Description: This course covers key analytical techniques used in the analysis and forecasting of time series data. Specific topics include the role of forecasting in organizations, exponential smoothing methods, stationary and non-stationary time series, autocorrelation and partial autocorrelation functions, univariate autoregressive integrated moving average (ARIMA) models, seasonal models, Box-Jenkins methodology, regression models with ARIMA errors, transfer function modeling, intervention analysis, and multivariate time series analysis techniques such as Vector Autoregression (VAR), Cointegration and Vector Error Correction Model (VECM).

ANLY 570 - Principles of Spatial Analysis

(3 semester hours)
Prerequisites: None
Description: This course introduces desktop Geographic Information Systems (GIS) through four distinct Units. 1) Spatial data concepts such as spatial data models and management, topology, spatial reference systems and cartographic principles. 2) Standard Spatial Operation tools found in off-the-shelf GIS software such as proximity and overlay analysis. 3) Advanced Spatial Analysis and Statistics to look deeper into geographic patterns, distribution measurement and clustering. 4) Individualized application of spatial analysis tools relevant to the student's industry focus.
On the practical side, the student will be introduced to two instances of GIS desktop software: ArcMap, and ArcGIS Pro. Both packages provide a menu driven introduction to common tools used in Spatial Analytics.

ANLY 580 - Special Topics in Analytics

(3 semester hours)
Prerequisites: None
Description: This course explores a topic or collection of topics of special interest that is timely and in response to critical or emerging topics in the broad field of analytics. Due to the nature of evolving topics, this course may not be eligible for repeat.

ANLY 585 - Research in Analytics

(3 semester hours)
Prerequisites: None
Description: This program cultivates and supports research partnerships between the student, faculty and other researchers. It provides the student with the opportunity to work on cutting-edge research. Research projects can be at any appropriate and approved level; introductory, participatory or expert. Each project requires an approved proposal, periodic status reports and a final written report with a presentation prepared by the student in collaboration with the research supervisor.

ANLY 600 - Optimized Analytics

(3 semester hours)
Prerequisites: ANLY 510
Description: This course introduces the fundamental tool in prescriptive analytics. Optimization is the process of selecting values of decision variables that minimize or maximize some quantity of interest. Optimization models have been used extensively in operations and supply chains, finance, marketing, and other disciplines to help managers allocate resources more effectively and make lower cost or more profitable decisions.

ANLY 610 - Analytical Methods III

(3 semester hours)
Prerequisites: ANLY 560 or ANLY 545
Description: This course provides the student with exposure to the theoretical background for advanced analytical topics and methods. Topics include unstructured data/information and big data. For example, the theoretical background required for the integration of data mining and text analytics or text mining are explored. Additional topics could include the implementation and use of data lakes and ontology evaluation.

ANLY 699 - Applied Project in Analytics

(3 semester hours)
Prerequisites: GRAD 695 or permission of instructor
Description: This course allows the student to pursue an area of interest that is within the broad scope of analytics. A faculty member will supervise this study.

ANLY 705 - Modeling for Data Science

(3 semester hours)
Prerequisites: Admission to the Data Sciences Doctoral Program
Description: This course provides a more in-depth presentation of the theory behind linear statistical models, segmentation models, and production level modeling. Further emphasis is placed on practical application of these methods when applied to massive data sources and appropriate and accurate reporting of results.

ANLY 710 - Applied Experimental and Quasi-Experimental Design

(3 semester hours)
Prerequisites: Admission to the Data Sciences Doctoral Program
Description: Methods and approaches used for the construction and analysis of experiments and quasiexperiments are presented, including the concepts of the design and analysis of completely randomized, randomized complete block, incomplete block, Latin square, split-plot, repeated measures, factorial and fractional factorial designs will be covered along with methods for proper analysis and interpretation in quasi-experiments.

ANLY 715 - Applied Multivariate Data Analysis

(3 semester hours)
Prerequisites: Admission to the Data Sciences Doctoral Program
Description: This course provides hands-on experience in understanding when and how to utilize the primary multivariate methods Data Reduction techniques, including Principal Components Analysis and Exploratory and Confirmatory Factor Analyses, ANOVA/MANOVA/MANCOVA, Cluster Analysis, Survival Analysis and Decision Trees.

ANLY 720 - Data Science from an Ethical Perspective

(3 semester hours)
Prerequisites: None
Description: This course introduces the power and pitfalls of handling user information in an ethical manner. The student is offered a historical and current perspective and will gain an understanding of their role in assuring the ethical use of data.

ANLY 725 - Research Seminar in Unstructured Data Analysis

(3 semester hours)
Prerequisites: Admission to the Data Sciences Doctoral Program
Description: This course follows a research seminar format. The student and faculty develop research proposals, analyses, and reporting in the domain of Unstructured Data. Topics of special interest in Unstructured Data analysis are presented by faculty and the student under faculty direction. Topics of special interest vary from semester to semester. Repeatable for additional content reasons. Cross-listed with ANLY 761.

ANLY 730 - Research Seminar in Forecasting

(3 semester hours)
Prerequisites: Admission to the Data Sciences Doctoral Program
Description: This course follows a research seminar format. The student and faculty develop research proposals, analyses, and reporting in the domain of Forecasting. Topics of special interest in Forecasting Data analysis are presented by faculty and the student under faculty direction. Topics of special interest vary from semester to semester. Repeatable for additional content reasons. Cross-listed with ANLY 762.

ANLY 735 - Research Seminar in Machine Learning

(3 semester hours)
Prerequisites: Admission to the Data Sciences Doctoral Program
Description: This course follows a research seminar format. The student and faculty develop research proposals, analyses, and reporting in the domain of Machine Learning. In addition, topics of special interest in Machine Learning are presented by faculty and the student under faculty direction. Topics of special interest vary from semester to semester. Repeatable for additional content reasons. Cross-listed with ANLY 763.

ANLY 740 - Graph Theory

(3 semester hours)
Prerequisites: Admission to the Data Sciences Doctoral Program
Description: This course introduces standard graph theory, algorithms, and theoretical terminology. Including graphs, trees, paths, cycles, isomorphisms, routing problems, independence, domination, centrality, and data structures for representing large graphs and corresponding algorithms for searching and optimization.

ANLY 745 - Functional Programming Methods for Data Science

(3 semester hours)
Prerequisites: Admission to the Data Sciences Doctoral Program
Description: This course is designed to build on the Functional Programming Methods for Analytics course. The student works to extend programming skills to write the student's own versions of popular statistical functions using a current programming language.

ANLY 755 - Advanced Topics in Big Data

(3 semester hours)
Prerequisites: Admission to the Data Sciences Doctoral Program
Description: Topics include the design of advanced algorithms that are scalable to Big Data, high performance computing technologies, supercomputing, grid computing, cloud computing, and Parallel and Distributed Computing, and issues in data warehousing.

ANLY 760 - Doctoral Research Seminar

(6 semester hours)
Prerequisites: Completion of doctoral coursework requirements; pass qualification examination
Description: This seminar provides support to the doctoral student within their specific domains of research. Led by the faculty advisor for that domain, the course is designed to provide a forum where faculty and the student can come together to discuss, support, and share the experiences of working in research.

ANLY 761 - Research Seminar in Unstructured Data Analysis

(3 semester hours)
Prerequisites: Completion of doctoral coursework requirements; pass qualification examination
Description: This course follows a research seminar format. Students and faculty develop research proposals, analyses, and reporting in the domain of Unstructured Data. Topics of special interest in Unstructured Data analysis are presented by faculty and students under faculty direction. Topics of special interest vary from semester to semester. Cross-listed with ANLY 725.

ANLY 762 - Research Seminar in Forecasting

(3 semester hours)
Prerequisites: Completion of doctoral coursework requirements; pass qualification examination
Description: This course follows a research seminar format. Students and faculty develop research proposals, analyses, and reporting in the domain of Forecasting. Topics of special interest in Forecasting are presented by faculty and students under faculty direction. Topics of special interest vary from semester to semester. Cross-listed with ANLY 730.

ANLY 763 - Research Seminar in Machine Learning

(3 semester hours)
Prerequisites: Completion of doctoral coursework requirements; pass qualification examination
Description: This course follows a research seminar format. Students and faculty develop research proposals, analyses, and reporting in the domain of Machine Learning. Topics of special interest in Machine Learning are presented by faculty and students under faculty direction. Topics of special interest vary from semester to semester. Cross-listed with ANLY 735.

ANLY 799 - Doctoral Studies

(6 semester hours)
Prerequisites: Completion of doctoral coursework requirements; pass qualification examination
Description: Advancement to candidacy is a prerequisite of this course. This is an individual study course for the doctoral student. Content to be determined by the student and the student's Doctoral Committee. May be repeated for credit.

BTEC 502 - Biomaterials

(3 semester hours)
Prerequisites: None
Description: There is a constant need for new biomaterials in life sciences to support novel technologies. This course is designed to introduce the student to the various classes of biomaterials currently in use and their application in selected subspecialties of medicine/industrial processes. The student will learn about the concepts behind developing materials for use in medical or industrial biotechnology field. The student will gain an understanding of material properties, various biological responses to materials, and the clinical context of their use. Aspects of manufacturing processes, cost, sterilization, packaging, and regulatory issues will be addressed.

BTEC 508 - Omics for Life Sciences

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: Studies on cataloging and characterization of genome and proteome are on the forefront of research. Recently, there has been a considerable amount of work happening with genome and proteome data for selective manipulation of metabolic pathways, the metabolomics. The three fields are aggressively used in several areas for innovation in diagnostics, biomanufacturing, biomarker studies, and drug discovery to name a few. This course covers the basics of these three "omics" fields from the standpoint of using the information for developing new biotechnologies, especially in personalized medicine. The significance of next generation sequencing will be covered.

BTEC 522 - Graduate Biotechnology Seminar

(3 semester hours)
Prerequisites: None
Description: This course introduces the student to fundamental topics in innovation, regulatory practices and ethics for various biotechnology industries and communities. The intention is to allow the student to learn about these diverse but inter-related areas that coalesce science and business disciplines. With the help of industry experts, case studies, and current literature, the student explores the interrelationship of these areas for creating productive collaborations within biotechnology industry with respect to compliance, innovation, and ethical decision-making.

BTEC 540 - Biostatistics

(3 semester hours)
Prerequisites: Undergraduate level Math or by permission of the instructor
Description: This course introduces statistical concepts and analytical methods as applied to data encountered in biotechnology and biomedical sciences. It emphasizes the basic concepts of experimental design, quantitative analysis of data, and statistical inferences. Topics include probability theory and distributions, population parameters and their sample estimates, descriptive statistics for central tendency and dispersion, hypothesis testing and confidence intervals for means, variances, and proportions, the chi-square statistic, categorical data analysis, linear correlation and regression model, and analysis of variance. The course provides the student a foundation to evaluate information critically to support research objectives and product claims and to gain better understanding of statistical design of experimental trials for biological products/devices.

BTEC 550 - Instrumentation in Biotechnology Industry

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: Instrumentation and application of various equipment is central to research and commercial production in the biotechnology industry. This course will familiarize the student with which instruments are used for which biotechnology applications and their principles of operation and limitations. Different biomolecules require different and customized protocols for isolation, purification, and characterization. The course offers an overview of instruments

such sonicator, ultracentrifuges, spectrophotometers, etc. The course also covers the significance of instrument validation and calibration.

BTEC 560 - Design of Experiment

(3 semester hours)
Prerequisites: BTEC 540, enrolled in the Biomanufacturing graduate certificate program, or by permission of instructor
Description: This course allows the student to design an experiment and learn methodology for data analysis. Components such as major characteristics of a scientific experiment, running statistical analyses to perform various tests to check validity of the data would be covered. In a case-based manner, the student works on design of an experimental protocol for an assigned conceptual research project. Trouble-shooting strategies and analyzing data sets would be covered.

BTEC 610 - Advanced Topics in Drug Discovery and Delivery

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: This course introduces the student to the planning and preparatory phase skills required to develop potential new drugs and biologics efficiently. The student gains a thorough appreciation of FDA regulations and guidelines. It is known that in the drug discovery sector, it is important to plan before the proceeding to the development phase. With emphasis on the process, the course focuses on the final analysis and report before developing the protocols. Other important aspects of drug development covered in the course are preclinical investigations; new drug application (NDA) or biologic license application (BLA) format and content; clinical development plans; product and assay development; the Investigational New Drug (IND) process; and trial design, implementation, and management. Lastly, the course provides an overview of trending concepts such as controlled and targeted drug delivery.

BTEC 612 - Regulatory Affairs in Life Science Industries

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: Regulatory affairs (RA) are rules and regulations that oversee and govern product development and post-approval marketing in the life sciences. For US companies, Food and Drug Administration (FDA) establishes and oversees the applicable regulations under several statutes, partnerships with legislators, patients, and customers. The commercializable products for the Biotechnology sector can be food, drugs, biologics, or medical devices. Each type is regulated by a different center within the FDA. This course provides an overview of RA, and its effect on product development. The course covers RA history, various regulatory agencies, methods to access regulatory information, procedures for drug submissions, biologics submissions, and medical device submissions. It also addresses Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP), and FDA inspections. The course includes guest lectures, actual case studies and real world scenarios. As a course project, the student creates a conceptual submission document for a hypothetical drug/biologic/medical device approval.

BTEC 615 - Biomedical Devices and Prototyping

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or any other relevant field or by permission of instructor
Description: This course familiarizes the student with basic principles of biosensors design and applications. Biomedical devices such as Biosensors are one of the most innovative, complex, and fastest growing area of biotechnology today; the interface between biotechnology, nanotechnology and micro-electronics industries. The course covers a variety of biosensors based on whole cells, nucleic acids, proteins, antibodies and enzymes as well as

new and emerging technologies related to designing, fabricating, and applying multi-array biochips and micro-fluidic systems (lab-on-the-chip). Practical applications of this technology in health care, environment, medical diagnostics, defense and other areas are explored.

BTEC 618 - Principles of Bioprocessing

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or any other relevant field or by permission of instructor
Description: Bioprocessing deals with the isolation, purification, and characterization of industrial bio-products. This course prepares the student with skills needed in bioprocessing procedures used in industry. Fundamental scientific principles underlying the recovery, purification and formulation of biomolecules, especially proteins, or other industrial bio-products are covered. Identification or delineation of key chemical and physical properties of biomolecules that impact downstream processing and formulation development are emphasized. Introduction to analytical and small-scale purification procedures exposes the student to key scientific principles and small-scale unit operations.

BTEC 620 - Emerging Trends in Diagnostics

(3 semester hours)
Prerequisites: None
Description: This course provides an overview of the fundamental principles of molecular diagnostics and explores the use of molecular techniques in the diagnosis of disease/infection/contaminants. Diagnostics has impacted several fields such as human health, environment, and food and agriculture. Development of novel diagnostics technologies have depended on discovery of biomarkers for multiple applications in fields such as drug discovery, drug delivery, and diagnostics in general. Topics covered in this course include: biomarkers, protein and nucleic acid structure-function, identification and amplification techniques used in infectious disease diagnosis, components of a molecular diagnostics, companion diagnostics, and evaluation of controls to validate results obtained. This course allows innovative use of current literature and technology with an entrepreneurship element. The student has an opportunity to use course material and available technology to design a conceptual assay/device for a chosen target and integrate it into a conceptual course project assignment.

BTEC 622 - Principles of Accounting and Finance

(3 semester hours)
Prerequisites: None
Description: This course is offered to expose the student to a basic introduction to principles of accounting and finance for the life science industry. Accounting and finance take different shades when one compares revenues for giants like Target with that for a pharma company. The student studies life science companies and their accounting procedures. Impact of significant adjustments and estimates on revenue counting, health insurance, managed care, and governmental contracts is covered. Also covered are accounting practices related to multi-round private financing and IPO timing for start-ups. The student is taught the basics of money management, the language and vocabulary of finance, how to communicate scientific concepts to potential investors, and how to generate fiscal plans/milestones. Course activities enable the student to create and analyze financial documents such as a term sheet, a contract and a balance sheet. The student is also presented the concepts of financial risk and the time value of money. This course will use real company scenarios and case studies from life sciences companies.

BTEC 625 - Pharmacogenomics

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: The genetic basis of variability in drug response can contribute to drug efficacy and toxicity, adverse drug reactions and drug-drug interactions. Healthcare professionals need an understanding of the genetic component of

patient variability to deliver effective individualized pharmaceutical care. This course offers an introduction to the evolution of pharmacogenetics/pharmacogenomics, the human genome and modern applications of DNA information related to diagnostics, drugs and therapeutics. Emphasis is placed on concepts and methodologies for using an individual's genetic make-up to determine that individual's predisposition towards diseases and ability to respond to drugs. Understanding of the basics of pharmacogenomics enables the student to better understand and manage the new genomics based tools and make best treatment choices.

BTEC 630 - Cancer Biotechnology

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: Cancer has a huge impact on our society and is one of the major factors driving biomedical research related to various areas such as imaging, diagnosis, and therapy. This course provides a comprehensive overview of the molecular biology and genetic basis of cancer. Biotechnological research on the molecular mechanisms of cancer has resulted in more effective treatments, sensitive diagnostic procedures and strategies for prevention. The course covers topics such as mutations leading to deregulation of programmed cell death, their impact on cell proliferation, and cell differentiation. Cancer and medical intervention is also reviewed. It allows the student to study traditional treatment methods and new treatment protocols for cancer therapies. The challenges of early diagnostics are also covered.

BTEC 634 - Healthcare Economics: Fundamentals for Providers and Biotech Professionals

(3 semester hours)
Prerequisites: None
Description: Patients, healthcare providers, and biotech industry professionals have an interest in the best possible medical care, but healthcare services and products come at a cost. This course explores economics of topics that impact the cost of healthcare as we know it today, and how the healthcare technologies of the future will be funded. Additional questions, such as who pays and who gets access when healthcare is in limited supply, are discussed. Among the factors explored are market dynamics, public policy, technology, reimbursements and workforce and patient choices. Case studies, course papers, and group discussions are used to offer the course content in an engaging and interactive mode. This course requires no previous study of finance or economics.

BTEC 635 - Clinical Pharmacology

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: Clinical pharmacology deals with drug development and drug utilization in therapeutics. This course covers the advancements regarding drug action and efficacy. Concepts of pharmacokinetics, drug metabolism and transport, pharmacogenetics, assessment of drug effects, and drug therapy in special populations are explored. Expert knowledge is shared about drug development and content specialization needed to stay competitive and build opportunities for career options.

BTEC 640 - Trends in Regenerative Medicine

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: Tissue engineering (TE) and regenerative medicine (RM) are geared towards developing biological substitutes that restore, maintain, or improve damaged tissue and organ functionality. While tissue engineering and regenerative medicine have hinted at much promise in the last several decades, significant research is still required to provide exciting alternative materials to finally solve the numerous problems associated with traditional implants. This course covers relevant biological, engineering, clinical, legal, regulatory and ethical principles and perspectives to

understand the basics of RM. This course also introduces the student to the current state of the RM field, global market trends and opportunities and challenges in process development, manufacturing, and commercialization.

BTEC 650 - Fermentation Technologies

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: Fermentation technology focusses on use of recombinant microorganisms for several industrial processes, i.e. biomanufacturing. This course requires the student to conceptually design a process for biomanufacturing a target product. This includes the basics of strain selection, development, and process optimization. Application of strain morphology, physiology and DNA sequence- based methods are analyzed for industrial processes. The student studies microbial metabolism and its significance to the manufacturing process. Fundamentals of microbial growth, growth stoichiometry, types of growth media (defined, semi-defined, complex) and media optimization are covered. The course provides an overview of fermenter design concepts and operational principles for a fermentation process using bioreactors.

BTEC 655 - Industrial Enzymes and Proteins

(3 semester hours)
Prerequisites: Bachelor of Science degree in Biotechnology, Life Science or other relevant field or by permission of instructor
Description: There is significant commercial activity in the biomanufacturing sector. Key products include vaccines, antibiotics, or various industrial enzymes. The basics of recombinant DNA (rDNA) principles in modification, selection, and application of recombinant microbial strains for industrial enzyme and protein production are studied. Theoretical foundations of microbial production and detection of recombinant protein products such as enzymes, hormones, and antibiotics are covered. The course provides an overview of basic methodologies involved in genetic manipulation of microbes to produce recombinant peptides and proteins. This would focus on use of plasmids, role of promoters and its use in control of gene expression with the end goal of generating enzymes and whole cells for industrial catalytic processes.

BTEC 672 - Legal Affairs and Policies for Life Science Industry

(3 semester hours)
Prerequisites: None
Description: This course provides the student an overview of key legal concepts and policies that govern research, development and commercial activities within the biotech industry. The course is structured from a company's perspective and introduces the student to topics and strategies critical to management while considering new topics and products. Selected cases, videos of speeches, and assigned readings illustrate how the laws that provide protection of society and promotion of social goals operate. Procedures that allow navigating the middle ground while dealing with competition in the biotech and pharma industry would be covered as well. This course requires no previous legal study.

BTEC 675 - Innovation and Improvisation in Research and Development

(3 semester hours)
Prerequisites: None
Description: This course prepares the student for the research and development sector. The student develops creative problem-solving abilities and other skills necessary for innovative approaches in managing research and development units. The resolution of conflicts between Research and Development, manufacturing, and marketing in a high technology firm are studied. The student explores various coping strategies, ways to maintaining entrepreneurial spirit and encourage innovation as the company develops into a formal administrative organization, identify R &D issues and strategies to resolve them. Mass production techniques such as Just-In-Time, On-Job Training and Total Quality Management to the real world of high technology Research & Development (R&D) are studied. As a team project for

the course, the student identifies and develops solutions to practical problems or market needs for a hypothetical scenario.

BTEC 698 - Biotechnology Graduate Internship

(3 semester hours)
Prerequisites: Completion of 6 credits in the BTMS program
Description: This graduate internship course provides the student an opportunity to serve as a graduate intern to learn the skills of a certain job in real world situation. It is the student's responsibility to identify an industry or an organization from the field of interest and work on a mutually relevant topic under direct supervision of an employee from that company.

BTEC 699 - Applied Project in Biotechnology

(3 semester hours)
Prerequisites: GRAD 695 or permission of instructor
Description: This course allows the student to pursue an area of interest that is within the broad scope of Biotechnology. A faculty member will supervise this study.

CISC 504 - Principles of Programming Languages

(3 semester hours)
Prerequisites: A Baccalaureate degree in computer science or a related technical field (e.g., electrical and computer engineering, information science, operations research) or permission of CISC grad committee *(This course is designed for the student that does not have a CS background)*
Description: This course explores a topic of collection of topics of special interest that is timely and in response to critical or emerging topics in the broad field of computer information sciences. The student with prior math or engineering education may have a foundation for the statistical concepts they encounter in a computer science graduate program, but not enough programming experience to keep up with the analysis, modeling and creating their own computational solutions. This course is intended to give the student the programming capability and experience required to succeed in their graduate study of master computer information sciences. The course is an application-driven and solution strategies with Python. Furthermore, integration between Python and other languages is also covered. Topics include programming paradigms, functional programming scripting languages, objects, algorithm design and analysis, trees, graphs, sorting and searching. The focus is on how these concepts relate to computational tasks in science and engineering.

CISC 510 - Object-Oriented Software

(3 semester hours)
Prerequisites: Baccalaureate degree in Computer and Information Sciences with a concentration in Software Engineering and Systems Analysis or the equivalent.
Description: This course develops fluency in object-oriented design. The student studies semantics of object-oriented languages, strengths and limitations of the object-oriented approach, processes that can lead to good design outcomes, graphical and textual representations for design including UML, common problems and some of the patterns that can solve them, and refactoring utilizing modern IDEs. The student develops an ability to read and critique designs, and to clearly present and advocate design ideas.

CISC 520 - Data Engineering and Mining

(3 semester hours)
Prerequisites: Baccalaureate degree in Computer and Information Sciences with a concentration in Software Engineering and Systems Analysis or the equivalent.

Description: This course addresses the emerging issues in designing, building, managing, and evaluating advanced data-intensive systems and applications. Data engineering is concerned with the role of data in the design, development, management, and utilization of complex computing/information systems. Areas of interest include database design; meta knowledge of the data and its processing; languages to describe data, define access, and manipulate databases; and strategies and mechanisms for data access, security, and integrity control. Data mining is a rapidly growing field that is concerned with developing techniques to assist managers to make intelligent use of these data repositories. A number of successful applications have been reported in areas such as credit rating, fraud detection, database marketing, customer relationship management, and stock market investments. The field of data mining has evolved from the disciplines of statistics and artificial intelligence.

CISC 525 - Big Data Architectures

(3 semester hours)
Prerequisites: Baccalaureate degree in Computer Information Systems, Computer Sciences, or related field.
Description: Government, academia and industry have spent a great deal of time, effort, and money dealing with increases in the volume, variety, and velocity of collected data. Collection methods, storage facilities, search capabilities, and analytical tools have all needed to adapt to the masses of data now available. Google paved the way for a new paradigm in Big Data, with two seminal white papers describing the Google File System, a distributed file system for massive storage, and MapReduce, a distributed programing framework designed to work on data stored in the distributed file system. This course introduces the student to the concepts of Big Data and describes the usage of distributed file systems and MapReduce programming framework to provide skills applicable to developers and the data scientist in any facet of industry.

CISC 530 - Computing Systems Architecture

(3 semester hours)
Prerequisites: Baccalaureate degree in Computer and Information Sciences with a concentration in Software Engineering and Systems Analysis or the equivalent.
Description: Modern computer information systems are ever-increasing in complexity and sophistication. As a result, software engineers must be able to make effective decisions regarding the strategic selection, specification, design, and deployment of information systems. Therefore, this course addresses the topics of architectural design that can significantly improve the performance of computer information systems. The course introduces key architectural concepts, techniques, and guidance to software engineers to enable them to make more effective architectural decisions.

CISC 540 - Agile Software Development

(3 semester hours)
Prerequisites: Bachelor of Science in Computer Information Systems, Computer Sciences, or related field.
Description: This course addresses what agile methods are, how they are implemented, and their impact on software engineering. A variety of agile methods are described, including but not limited to: Scrum, Extreme Programming, and Crystal Clear. The concerns associated with planning and controlling agile projects, along with the implications of agile development on the customer-developer dynamic are analyzed.

CISC 550 - Software Engineering in Mobile Computing

(3 semester hours)
Prerequisites: CISC 510 and CISC 520
Description: Recent years have witnessed the advent of wireless mobile and sensor technologies and the proliferation of application scenarios whereby large numbers of pervasive computing devices are connected to a wireless networking infrastructure in an ad hoc manner. The student is shown how to design, implement, and deploy location/context-aware applications that interact with Service Oriented Architecture (SOA) solutions. Topics to be covered include: basic user interfaces, application design, concurrency, and location-aware and other context-aware programming.

CISC 560 - Secure Computer Systems

(3 semester hours)
Prerequisites: Bachelor of Science in Computer and Information Sciences with a concentration in Software Engineering and Systems Analysis or the equivalent.
Description: This course focuses on the design principles for secure computer systems. Topics regarding authentication, access control and authorization, discretionary and mandatory security policies, secure kernel design, secure operating systems, and secure databases are covered from a systems architecture perspective. Emphasis is on the design of security measures for critical information infrastructures. Upon completion of this course, the student is able to design, implement, and manage secure computer systems through the design of a security awareness program.

CISC 570 - Advanced Database Security

(3 semester hours)
Prerequisites: CISC 560
Description: This course focuses on topics related to the design and implementation of secure data stores. Emphasis is placed on multi-level security in database systems, covert channels, and security measures for relational and object-oriented database systems. This course teaches how to recognize the insecurities present within common database systems and how these flaws can leave a database wide open to attack. The course covers how hackers discover and exploit vulnerabilities to gain access to a data store.

CISC 580 - Advanced Network Security

(3 semester hours)
Prerequisites: CISC 560
Description: This course covers fundamental concepts, principles, and practical networking and inter-networking topics relevant to the design, analysis, and implementation of enterprise-level trusted networked information systems. Topics include networking and security architectures, techniques, and protocols at the various layers of the internet model. Security problems in distributed application environments are analyzed and solutions discussed and implemented.

CISC 585 - Principles of Software Architectural Patterns

(3 semester hours)
Prerequisites: A baccalaureate degree in computer science or a related technical field
Description: This course will serve as a catalog of commonly used design patterns, prominent and dominant software patterns, and their applications. This course is divided into three modules. First, Software Architecture Patterns covers the various architectural patterns of object-oriented, component-based, client server, and cloud architecture. The need for software patterns is described. The various architectural patterns are listed and explained in detail in order to convey the what, where, why and how of architectural patterns. Second, Enterprise Integration Patterns covers enterprise application integration patterns and how they are designed. Patterns of service-oriented architecture (SOA), event driven architecture (EDA), resource-oriented architecture (ROA), big data analysis architecture, and microservice architecture (MSA) will be carefully studied. Finally, Patterns for Containerized and Highly Reliable Applications covers advanced topics such as Docker containers, high-performance, and reliable application architectures. Key takeaways include understanding what architectures are, why they are used, and how and where architecture design and integration patterns are being leveraged to build bigger and better systems. Cross-listed with NGEN 585.

CISC 590 - Information Security Project

(3 semester hours)
Prerequisites: CISC 560
Description: This project course serves as a capstone for the specialization in Information Security. The class focuses on techniques for protecting critical information infrastructures through case studies, application development, and

systems assessment, while the project's activities encompass research, development and analysis/synthesis for a particular problem or opportunity.

CISC 592 - Software Architecture and Microservice

(3 semester hours)
Prerequisites: Bachelor of Science in Computer Science or a related technical field (e.g., Electrical and Computer Engineering, Information Science, Operations Research) or permission of CISC grad committee.
Description: This course explores a collection of topics in Software Architecture and Microservices and introduces concepts and best practices of software architecture. It deals with; high-level building blocks that represent the underlying software system, how a software system is structured, and how that system's elements are meant to interact. Fundamentals of software architecture, its principles, elements, components, configurations and architectural structures and styles will also be discussed. Special focus will be given to the interaction between quality attributes and software architecture. Societal and ethical implications of software architecture and microservices will also be discussed

CISC 593 - Software Verification and Validation

(3 semester hours)
Prerequisites: CISC 592
Description: This course will introduce various software testing techniques such as; unit testing, integration testing, system testing, acceptance testing, and regression testing, types of software errors, reporting and analyzing software errors, problem tracking systems, test planning, test case design, and verification & validation. The course also explores functional (black box) methods for testing software systems, reporting problems effectively and planning testing projects. The student will apply testing techniques that they have learned, throughout the course, to a sample application.

CISC 594 - Software Testing Principles and Techniques

(3 semester hours)
Prerequisites: CISC 593
Description: This course explores a collection of topics in Software Testing Principles and Techniques. It introduces testing techniques, software quality fundamentals, and focuses on software quality assurance for the entire software development lifecycle. It covers topics such as; Quality factors, Software Quality Requirements, Reviews, Software Audits, Software Configuration Management, Policies, Processes, and Procedures, Measurement, Risk Management, Software Quality Assurance Plan, Software Quality Models, Test Automation, Testing Tools, Black Box and White Box testing techniques. The Pareto Principle Applied to Software Quality Assurance, and Software Testing Strategies will also be discussed.

CISC 595 - Software Architectural Patterns Design and Implementation

(3 semester hours)
Prerequisites: CISC 585 or NGEN 585
Description: This course will serve as a catalog of commonly used open source software in the design and implementation of software solutions. The student will be exposed to open source project structure, work on an open source project, and be expected to make a significant contribution through their own custom design projects.

CISC 600 - Scientific Computing I

(3 semester hours)
Prerequisites: A baccalaureate degree in computer science or a related technical field (e.g. electrical and computer engineering, information science or operations research).
Description: This course provides an overview of scientific computing and covers: Solution of Linear Algebraic

Equations, Interpolation and Extrapolation, Integration and Evaluation of Functions, Random Numbers, and Sorting. The course uses C++ programming language as the base language to solve the problem sets. The student may choose to use another programming language as well. The course is conceived as an introduction to the thriving field of numerical simulation for computer scientists, mathematicians, engineers, or natural scientists without an already strong background in numerical methods.

CISC 601 - Scientific Computing II

(3 semester hours)
Prerequisites: CISC 600
Description: Scientific Computing II covers: root finding and nonlinear sets of equations, minimization or maximization of functions, eigensystems, fast Fourier transform, Fourier and spectral applications, statistical description of data, and modeling of data. The course uses C++ programming language as a base language to solve the problem sets, or a student can choose another programming language. The course is intensely practical with fully worked examples and graded exercises.

CISC 603 - Theory of Computation

(3 semester hours)
Prerequisites: CISC 530 and CISC 610
Description: This course contains abstract models of computation and computability theory including formal languages, finite automata, regular expressions, context-free grammars, pushdown automata, Turing machines, primitive recursive and recursive functions, and decidability and un-decidability of computational problems.

CISC 610 - Data Structures and Algorithms

(3 semester hours)
Prerequisites: CISC 504
Description: This course emphasizes fundamental algorithms and advanced methods of algorithmic design, analysis and implementation. This class overs techniques used to analyze problems and algorithms (including asymptotic, upper/lower bounds, best/average/worst case analysis, amortized analysis, complexity), basic techniques used to design algorithms (including divide and conquer/greedy/dynamic programming/heuristics, choosing appropriate data structures) and important classical algorithms (including sorting, string, matrix, and graph algorithms) and data structures.

CISC 611 - Network Operating Systems

(3 semester hours)
Prerequisites: CISC 530 and CISC 610
Description: This course introduces the principles and implementations of operating systems and networking. The operating system manages hardware resources and provides a simplified interface for programs to use these resources. Networking allows different computers to communicate and potentially act as a larger virtual system. These topics are closely related; networking is often managed by the operating system (and always requires use of the hardware it manages) and the operating system uses the network to provide services like the file system. C++ language is needed to facilitate out study to these topics which provides low-level access to the hardware and is often used in operating systems and networking.

CISC 612 - Elements of Computing Systems

(3 semester hours)
Prerequisites: CISC 611
Description: This course is an integration process of key notions from algorithms, computer architecture, operating

systems, compilers, and software engineering into one unified framework. This is done constructively, by building a general-purpose computer system from the ground up. In the process, many ideas and techniques are used in the design of modern hardware and software systems, and discuss major trade-offs and future trends. This is a hands-on course, evolving around building the full set of HW and SW modules including the chip set of simple computers using a simulator, developing the assembler, building part of the virtual machine translator and a simple compiler all the way to a simple programming language and a simple game.

CISC 614 - Computer Simulation

(3 semester hours)
Prerequisites: CISC 601
Description: This course is about the use of simulation to make better business decisions in application domains from healthcare to mining, heavy manufacturing to supply chains, and everything in between. It is written to help both technical and non-technical users better understand the concepts and usefulness of simulation. The student can use the programming languages of their choice or use an off-the-shelf software to implement their projects.

CISC 620 - Principles of Machine Learning

(3 semester hours)
Prerequisites: CISC 530, CISC 600, and CISC 610
Description: This course introduces the basic idea of machine learning and the application to data from real world problems. Topics include: Classification as a Problem-Solving Tool, Similarity Measures and Clustering. The Classification Process, Classification for Sentiment Analysis, Advanced Recommendations, FFT Classifiers, Computer Vision & Pattern Recognition, Dimensionality Reduction, and Big Data & Machine Learning.

CISC 621 - Statistical Pattern Recognition

(3 semester hours)
Prerequisites: CISC 610, equivalent, or permission of the instructor
Description: Statistical pattern recognition techniques are used to design automated systems that improve their own performance through experience. This course covers the methodologies, technologies, and algorithms of statistical pattern recognition from a variety of perspectives. The objective is to provide a reasonable answer for all possible data and to classify input data in to objects or classes based on certain features. After taking the course, the student should have: a clear understanding of the design and construction and a pattern recognition system; major approaches in statistical and syntactic pattern recognition; some exposure to the theoretical issues involved in pattern recognition system design such as the curse of dimensionality and clear working knowledge of implementing pattern recognition techniques.

CISC 625 - Digital Image Processing

(3 semester hours)
Prerequisites: CISC 621, equivalent, or permission of the instructor
Description: This course focuses on explaining and demonstrating the limitations and tradeoffs of various digital image representations, such as computed 3-D images, grayscale versus color, and tools such as wavelet transforms and image compression techniques. Additionally, displaying the ability to manipulate both binary and grayscale digital images using morphological filters and operators to achieve a desired result; showing how higher-level image concepts such as edge detection, segmentation, representation, and object recognition can be implemented and used.

CISC 661 - Principles of Cybersecurity & Cyber Warfare

(3 semester hours)
Prerequisites: Bachelor of Science degree in Computer and Information Sciences

Description: The course introduces the student to the interdisciplinary field of cybersecurity. Topics include the evolution of information security into cybersecurity and exploring the relationship of cybersecurity to organizations and society. The analyses of the threats and risks to/in these environments are examined. The ultimate goal of this course is for the student to acquire the advanced knowledge required to develop the skills needed to integrate knowledge from this course into a workplace environment. Cross-listed with CYOM 661.

CISC 662 - Ethical Hacking Development Lab

(3 semester hours)
Prerequisites: CISC 661 or CYOM 661
Description: This course integrates cyber risk management into day-to-day operations. Additionally, it enables an enterprise to be prepared to respond to the inevitable cyber incident, restore normal operations and ensure that the enterprise assets and the enterprise's reputation are protected. This course focuses the student on a broad range of topics relative to risk-based planning for enterprise cybersecurity. The intent is to focus on creating risk assessment and modeling approaches to solve cybersecurity issues, so organizations can build security framework and sustain a healthy security posture. This course analyzes external and internal security threats, failed systems development and system processes and explores their respective risk mitigation solutions through policies, best practices, operational procedures, and government regulations. Cross-listed with CYOM 662.

CISC 663 - Cyber Risk Assessment and Management

(3 semester hours)
Prerequisites: CISC 661 or CYOM 661
Description: This course integrates knowledge accumulated from the prerequisites and serves as a capstone for the concentration in Computer Security. Attention is focused on the techniques for protecting critical information infrastructures and the process of identifying the risk to data and information using case studies, application development, and systems assessment. Cross-listed with CYOM 663.

CISC 664 - Advanced Digital Forensics

(3 semester hours)
Prerequisites: CISC 662
Description: Digital Forensics is "the application of computer science and investigative procedures for a legal purpose involving the analysis of digital evidence." Digital forensics encompasses much more than just laptop and desktop computers. Mobile devices, networks, and "cloud" systems are very much within the scope of the discipline. It also includes the analysis of images, videos, and audio (in both analog and digital format). The goal is to provide digital evidence that are obtained (both in direct and indirect ways) from digital media. The course focuses on the analysis of authenticity, comparison, and enhancement as the main vehicle to obtain digital evidences (both in direct and indirect ways) from digital media.

CISC 665 - Biometric Security Systems

(3 semester hours)
Prerequisites: CISC 662
Description: Biometric security systems is a rapidly evolving field with applications ranging from accessing one's computer to gaining entry into a country. Biometric systems rely on the use of physical or behavioral traits, such as fingerprints, face, voice, and hand geometry, to establish the identity of an individual. The deployment of large-scale biometric security systems in both commercial and government applications increases the public's awareness of this technology. This rapid growth also highlights the challenges associated with designing and deploying such systems. The core computational component of biometric systems is biometric identification (or recognition), and it is indeed a grand challenge in its own right. The purpose of this course is to expose the student to current biometric identification techniques and systems, teach them to coin their own biometric security applications through capturing human

biometric traits, creating unique identifications for them, build classification systems that can identify individuals, and make decisions to maintain security parameters.

CISC 680 - Special Topics in Computer Information Sciences

(3 semester hours)
Prerequisites: None
Description: This course explores a topic or collection of topics of special interest that is timely and in response to critical or emerging topics in the broad field of computer information sciences. Due to the nature of evolving topics, this course may not be eligible for repeat.

CISC 681 - Special Topics in Scientific Computing

(3 semester hours)
Prerequisites: CISC 614 or permission of instructor
Description: This course explores a topic or collection of topics of special interest that is timely and in response to critical or emerging topics in the broad field of scientific computing in computer information sciences.

CISC 682 - Special Topics in Software Engineering and Software Testing

(3 semester hours)
Prerequisites: CISC 593 or permission of instructor
Description: This course explores a topic or collection of topics of special interest that is timely and in response to critical or emerging topics in the broad field of software engineering and software testing in computer information sciences.

CISC 683 - Special Topics in Cyber Security

(3 semester hours)
Prerequisites: CISC 663 or permission of instructor
Description: This course explores a topic or collection of topics of special interest that is timely and in response to critical or emerging topics in the broad field of cyber security in computer information sciences.

CISC 690 - Current Topics in Computer Information Sciences

(3 semester hours)
Prerequisites: None
Description: This course explores a topic or collection of current topics that are timely and in response to critical or emerging topics in the broad field of computer information sciences.

CISC 691 - Current Topics in Scientific Computing

(3 semester hours)
Prerequisites: CISC 614 or permission of instructor
Description: This course explores a topic or collection of current topics that are timely and in response to critical or emerging topics in the broad field of scientific computing computer information sciences.

CISC 692 - Current Topics in Software Engineering and Software Testing

(3 semester hours)
Prerequisites: CISC 593 or permission of instructor

Description: This course explores a topic or collection of current topics that are timely and in response to critical or emerging topics in the broad field of software engineering and software testing in computer information sciences.

CISC 693 - Current Topics in Cyber Security

(3 semester hours)
Prerequisites: CISC 663 or permission of instructor
Description: This course explores a topic or collection of current topics that are timely and in response to critical or emerging topics in the broad field of cyber security in computer information sciences.

CISC 699 - Applied Project in Computer Information Sciences

(3 semester hours)
Prerequisites: GRAD 695 or permission of instructor
Description: This course allows the student to pursue an area of interest that is within the broad scope of Computer Information Sciences. A faculty member will supervise this study.

CISC 701 - Contemporary Computing Systems Architectures

(3 semester hours)
Prerequisites: Admissions to the Computational Sciences Doctoral Program or permission of instructor
Corequisites: CISC 709
Description: This course attempts to change the way students learn and think about the design, organization and hardware of a computing system architecture to meet goals and functional requirements of future technological developments, demystify computer architecture through an emphasis on cost-performance-energy trades-offs and good engineering design. This will help the student to build rigorous quantitative foundation of long-established scientific and engineering disciplines. A special emphasis will be put on demonstrating these concepts through the "Putting It All Together" approach at the end of the set of necessary modules. Modules include pipeline organizations and memory hierarchies of the ARM Cortex A8 processor, the Intel core i7 processor, the NVIDIA GTX-280 and GTX-480 GPUs, and one of the Google warehouse-scale computers, to apply the cost-performance-energy principles to this material, and memory is critical resource for the rest of the modules.

CISC 709 - Contemporary Computing Systems Programming

(3 semester hours)
Prerequisites: Admissions to the Computational Sciences Doctoral Program or permission of instructor
Corequisites: CISC 701
Description: This course discusses and advocates a structured approach to parallel programming. This approach is based on a core set of common and composable patterns of parallel computation and data management with an emphasis on determinism and scalability. By using these patterns and also paying attention to a small number of factors in algorithm design (such as data locality), programs built using this approach have the potential to perform and scale well on a variety of different parallel computer architectures. A special emphasis will be put on both collective "data-parallel" patterns as well as structured "task-parallel" patterns such as pipelining and superscalar task graphs. The structured patter-based approach, like data-parallel models, addresses issues of both data access and parallel task distribution in a common framework. Optimization of data access is important for both many-core processors with shared memory systems and accelerators with their own memories not directly attached to the host processor. Extensive use of pertinent and practical examples from scientific computing will be made throughout. The programming languages used will be Python, Fortran, or C++. Both the shared and distributed paradigms of parallel computing will be covered via the OpenMP and MPI libraries.

CISC 719 - Contemporary Computing Systems Modeling

(3 semester hours)
Prerequisites: CISC 701 & CISC 709, or permission of instructor
Description: Real-world problems entail a hierarchy of systems that interact in complex ways. This causes such complex problems not to lend themselves to easy solutions with computational methods like classical parametric machine learning. The complexity arises from three main causes: high-dimensionality, unknown function properties, and computationally expensive analysis and simulation. These challenges with the presence high volume/velocity streaming data severely aggravate the difficulty and become the bottleneck for any computational solution. This course helps the student to explore some advanced modeling and optimization methods that can help solve such problems. Deep Learning (DL) allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. DL has the ability to discover convoluted structure in large data sets by using say the backpropagation algorithm to indicate how a machine should change its internal parameters that are used to compute the representation in each layer from the representation in the previous layer. Deep convolutional nets have brought about breakthroughs in processing images, video, speech and audio, whereas recurrent nets have shone light on sequential data such as text and speech. A special emphasis will be put on how to build applications using this approach that have the potential to perform and scale well on a variety of different previously studied parallel computing systems. Extensive use of parallel programming models like CUDA, C, Python, OpenMP and may be Fortran will be to conduct weekly projects.

CISC 727 - Research Explorations in Computational Sciences I

(3 semester hours)
Prerequisites: CISC 701 & CISC 709, or permission of instructor
Corequisites: CISC 719
Description: This course is about leading the student to explore some heavy research on a certain high-dimensional problem under the supervision of a research scientist in one of the computational sciences subdomains. The course outcome is expected to be the foundational part of a published research paper to be presented (later after augmented with other research work) in a research symposium. Special emphases put on how to build programs using this approach that have the potential to perform and scale well on a variety of different previously studied parallel computing systems. Extensive use of parallel programming models like CUDA, C, Python, OpenMP and may be Fortran will be to conduct weekly projects.

CISC 733 - Research Explorations in Computational Sciences II

(3 semester hours)
Prerequisites: CISC 727 or permission of instructor
Corequisites: CISC 777
Description: This is the second of the depth-level research explorations courses. The goal of this course is to continuous the realization efforts from course work of CISC 727. A published research paper on a computational solution in deep learning for the real-world problem selected in the prerequisite course is the expected outcome for this course. The paper is to be presented later after augmented with other research work in a research symposium. This paper should be a step toward choosing the research topic for the doctoral dissertation for the degree.

CISC 777 - Research Symposium Paper

(3 semester hours)
Prerequisites: CISC 727
Corequisites: CISC 733
Description: The course is of two parts: one, to allow the student to make progress on their research in a structured way and to help fulfill program requirements, and two, to present professionalization information crucial to success in the field. The course is organized largely around working on the research paper, with the goal of making it a conference-presentable and journal-publishable work.

CISC 787 - Doctoral Research Seminar I

(3 to 6 semester hours)
Prerequisites: CISC 777
Description: This course is the first of the two Doctoral Research Seminar courses. The course provides the student with the theoretical background and practical application of various research methods that can be used in computational sciences. The course provides a look to the research process and literature review and study the correlation and experimental research methods and design. Students will analyze several existing research studies and design and conduct studies. The principal work in this course is the research and writing of a substantial paper in a field related to the Ph.D. dissertation of each student. The student is expected to have a research topic and primary source base identified and the topic approved by the dissertation adviser.

CISC 797 - Doctoral Research Seminar II

(3 to 6 semester hours)
Prerequisites: CISC 787
Description: This course is the second of the two Doctoral Research Seminar courses. The course provides a deeper look to the research process, implementation methodology and research findings. The student will analyze several existing research studies and design and conduct studies. This course emphasizes advanced research goals and mastery of the relevant sub field. approved by the dissertation adviser.

CISC 799 - Doctoral Dissertation

(3 to 6 semester hours)
Prerequisites: CISC 797
Description: This is an individual study course for the doctoral student that culminates in a Ph.D. Thesis. Content to be determined by the student and the student's Doctoral Committee. The Computational Sciences thesis is an implementation of a serious experimental research that involves the formulation of a deductive model that makes novel and unforeseen predictions which should be then tested objectively and confirmed under conditions unfavorable to the hypothesis. In addition to a well written thesis, the student is required to deliver the computational solution in a specific domain. In support of their findings, the student is required to introduce a software package that meets the criteria of excellent software requirement. The thesis needs to show that the writer can produce their extended piece of work, in perfect English, and respects the standards of form and structure. May be repeated for credit.

CBDS 520 - Judgement and Decision Making

(3 semester hours)
Prerequisites: None
Description: Human Behavior is the result of complex interactions between physiological and psychological processes. This is an accelerated course designed to give the student a firm understanding of these processes, as well as insight into how this knowledge can be used to garner unique insights which can be leveraged to influence behavior. Foundational topics such as perception, learning and memory, emotion, and cognitive biases and attempt to exploit them via nudging are covered through lectures, discussion or current applied research, and a team project developing an applied behavioral research plan.

CBDS 535 - Quantitative Research Methods

(3 semester hours)
Prerequisites: ANLY 510
Description: The easiest way to find out about people is to ask them questions. As a result, a large amount of the data used to generate insights comes from simple survey questions. This course is designed to teach the student how to develop efficient questions and to deploy surveys in person, telephonically, or online (mobile). Statistical methods for determining question and construct reliability are covered. Course material is presented via lectures, texts (textbook and supplementary readings), and several projects.

CBDS 545 - Qualitative Research Methods

(3 semester hours)
Prerequisites: ANLY 510 and CBDS 535
Description: Innovative ideas often come from spontaneous conversation and interactions. Focus groups (panels) and observational research methods facilitate the discovery of these unique consumer insights. This course provides an overview of the proper use of focus groups, panels, and observational designs in consumer research. Central topics include question design, planning, implementation, moderation/observation techniques, virtual panels, data processing, and qualitative and quantitative analysis strategies. Course materials are presented via lectures, guest lectures, and as well as individual and team projects.

CBDS 550 - Sampling and Segmentation

(3 semester hours)
Prerequisites: ANLY 510 and CBDS 520
Description: To generate actionable insights and implement them effectively we need to know how consumers are distributed across the population, what segments will want a product or service, and how we can sample from relevant segments so that our data is representative of relevant populations. This is an advanced course designed to provide an overview of these topics from an applied analytic perspective. The first half of the course focuses on sampling methods for data collection such as: Stratification, cluster sampling, systematics selection, multistage sampling, and probability proportional to size sampling. The second half of the course focuses on analytic methods for the four main types of market segmentation: Demographic, behavioral, psychographic, and geographic. Material is presented via lectures, discussions, immersive labs, and an applied team project.

CBDS 620 - Marketing Applications

(3 semester hours)
Prerequisites: ANLY 510 and CBDS 550
Description: Bespoke marketing tools and methods of approach underly much of today's marketing research. This course is separated into three sections related to appealing to your customer base: The first covers conjoint analysis tools used to determine the value of product/services features as viewed by the customer and to assess (attractive) market prices. The second provides an overview of market mix modeling allowing for an efficient marketing plan to be deployed. The final section covers customer relationship management (CRM). An overview of what CRM is, what CRM has and has not yet delivered, popular CRM technologies, and how analytic techniques can be employed to determine customer equity, customer lifetime value, and predict customer loyalty and churn is provided. Material is presented via lectures (guest lectures), discussions of current research and theory, case studies, labs, and applied projects.

CBDS 680 - Special Topics in Applied Behavioral Research

(3 semester hours)
Prerequisites: CBDS 695
Description: Theories of human behavior and behavioral research methods are constantly evolving. This seminar is designed to provide an overview of the state-of-the-art in applied behavioral research. Each session will consist of a discussion of recent advances in consumer research and/or a relevant story pulled from the headlines. Guest lectures from academia, industry, and the public sector will also present their work and their views on the future of applied behavioral research.

CBDS 695 - Advanced Behavioral Research Methods

(3 semester hours)
Prerequisites: ANLY 510 and CBDS 535

Description: As technology advances so do applied behavioral research methodologies. This frequently updated course provides the knowledge and skills needed to conduct innovative applied behavioral research using emergent methodologies. Research applications covered include: Decision time analysis, mouse tracking, eye tracking, affect measurement, and practical neural measurement techniques (e.g., NIRS and ECG/EEG). Material is presented via lectures (guest lectures), discussions of transformative research, labs, and an immersive research project.

CBDS 699 - Applied Behavioral Research Project

(3 semester hours)
Prerequisites: CBDS 620 and CBDS 695
Description: This seminar is designed to assist the student as they produce the final deliverable of their studies - an applied behavioral research project. In the first weeks the student will deliver an overview of their project and what stage they are currently in. During the following weeks the student will deliver status updates allowing them to seek out feedback and advice for how to approach issues encountered (e.g., implementation and analysis problems), while also benefitting from their classmates' experiences. In the final weeks the student will give a presentation which will be in the format of a "mini-defense".

CYOM 503 - Principles of Computer Networking

(3 semester hours)
Prerequisites: A Baccalaureate degree in computer science or a related technical field (e.g., electrical and computer engineering, information science, cybersecurity) or permission of instructor
Description: Information networking lays the groundwork for analysis of concepts that form the foundation to study Cybersecurity. The Internet contains a constant flow of information in the form of packets over interconnected network devices. This topic covers protocols, software, hardware, and functions that support networking services, such as switching/routing, virtual networking concepts, domain name services, directory services, and other Internet required protocols.

CYOM 521 - Cybersecurity Architecture and Resiliency

(3 semester hours)
Prerequisites: A Baccalaureate degree in computer science or a related technical field (e.g., electrical and computer engineering, information science, cybersecurity) or permission of instructor
Description: To understand security architecture, you must first understand architecture in general. At first glance, security and architecture are diametrically opposed. Security is freedom from, or resilience against, potential harm. Architecture is meant to build things up to make them more useful. Security architecture is the design, development, and implementation of resilient networks and systems to protect the information that is stored, transmitted, and processed.

CYOM 535 - Principles of Cloud Security

(3 semester hours)
Prerequisites: Graduate Standing
Description: This course provides guidelines for data security utilizing cloud computing by determining the boundaries of the cloud service provider (CSP) responsible for ensuring that customer data is properly secured. Depending on the cloud services (i.e. IaaS, PaaS, SaaS), the security of the data is the responsibility of the Cloud Service Consumer (CSC) themselves. For example, in some cases the CSP may be responsible for restricting access to the data, while the CSC remains responsible for deciding which cloud service users (CSUs) should have access to it, and the behavior of any scripts or applications with which the CSU processes the data. This course identifies the security controls protecting CSC data that can be used in the different stages of the full data lifecycle.

CYOM 569 - Securing Software and Application Environments

(3 semester hours)
Prerequisites: Graduate Standing
Description: Cybersecurity for applications and software provides the security architecture as it applies to the continuous development and deployment of application and software. This course demonstrates the techniques to improve the organization's security at every level, including the application and software layer. By combining development operations and security with consideration for cloud services, an integrated approach is used to ensure the cyber protections are implemented at all levels of the infrastructure. This course will provide the skills to implement security at each layer, such as web application, cloud infrastructure, communication, and service delivery. Topics include exploring core security aspects of blocking attacks, fraud detection, cloud forensics, and incident response. Additionally, cybersecurity topics on extending development operations (DevSecOps) security practices, risk assessment, threat modeling, and continuous security monitoring.

CYOM 599 - Leadership, Ethics, and Compliance in Cybersecurity Industry

(3 semester hours)
Prerequisites: A Baccalaureate degree in computer science or a related technical field (e.g., electrical and computer engineering, information science, cybersecurity) or permission of instructor
Description: In this course, the student will explore leadership and ethical business decision making as related to the use of technology. Ethical obligations have both a professional and a personal dimension. Each are essential to consider; without a sense of personal ethics, one would be indifferent to their effect on the lives of others in circumstances where one's professional code is silent. Personal leadership helps us to be sure that we take full responsibility for our moral choices and their consequences. This course addresses professional leadership and ethics in information technology as it applies to practical business managers and systems. This course teaches the student how to gain knowledge and understanding of a number of aspects, including: the types of harms the public can suffer as result of misuse of information technology; the importance of an individual privacy of information; legal and constitutional rights to protect information; and obligations of organizations to protect the public and ethical decision making.

CYOM 661 - Principles of Cybersecurity & Cyber Warfare

(3 semester hours)
Prerequisites: Bachelor of Science degree in Computer and Information Sciences
Description: The course introduces the student to the interdisciplinary field of cybersecurity. Topics include the evolution of information security into cybersecurity and exploring the relationship of cybersecurity to organizations and society. Analysis of the threats and risks to/in these environments are examined. The ultimate goal of this course is for the student to acquire the advanced knowledge required to develop the skills needed to integrate knowledge from this course into a workplace environment. Cross-listed with CISC 661.

CYOM 662 - Ethical Hacking Development Lab

(3 semester hours)
Prerequisites: CISC 661 or CYOM 661
Description: This course integrates cyber risk management into day-to-day operations. Additionally, it enables an enterprise to be prepared to respond to the inevitable cyber incident, restore normal operations and ensure that the enterprise assets and the enterprise's reputation are protected. This course focuses the student on a broad range of topics relative to the tools used to protect the enterprise from today's cyber-threats. The intent is to focus on creating risk-based assessment tools for modeling approaches to solve cybersecurity issues, so organizations can build security framework and sustain a healthy security posture. This course analyzes external and internal security threats, failed systems development and system processes, and explores their respective risk mitigation solutions through policies, best practices, operational procedures, and government regulations. Cross-listed with CISC 662.

CYOM 663 - Cyber Risk Assessment and Management

(3 semester hours)
Prerequisites: CISC 661 or CYOM 661
Description: This course integrates knowledge accumulated from the prerequisites and serves as a capstone for the concentration in Computer Security. Attention is focused on the techniques for protecting critical information infrastructures and the process of identifying the risk to data and information using case studies, application development, and systems assessment. Cross-listed with CISC 663.

CYOM 683 - Special Topics in Cybersecurity Operations and Control Management

(3 semester hours)
Prerequisites: CYOM 663 or permission of instructor
Description: This course explores a topic or collection of topics of special interest that is timely and in response to critical or emerging topics in the broad field of Cybersecurity Operations and Control Management.

CYOM 693 - Current Topics in Cybersecurity Operations and Control Management

(3 semester hours)
Corequisites: CYOM 663 or permission of instructor
Description: This course explores a topic or collection of current topics that are timely and in response to critical or emerging topics in the broad field of Cybersecurity Operations and Control Management.

CYOM 699 - Applied Project in Cybersecurity Operations and Control Management

(3 semester hours)
Prerequisites: GRAD 695 or permission of instructor
Description: This course allows the student to pursue an area of interest that is within the broad scope of Cybersecurity Operations and Control Management. A faculty member will supervise this study.

ENTP 500 - Entrepreneurship and Innovation

(3 semester hours)
Prerequisites: Graduate Standing
Description: Entrepreneurship and innovation are drivers of transformative change. This course introduces the concepts of innovation and entrepreneurship and strategies to take an idea into execution. Moreover, entrepreneurial and innovation ecosystems, and innovation within corporations are studied by utilizing case studies of some Silicon Valley companies.

ENTP 510 - Entrepreneurship: From Traction to Scale

(3 semester hours)
Prerequisites: None
Description: This course introduces the theoretical knowledge and practical skills needed to successfully navigate through the second stage of the business start-up, which is to gain traction and scale. The student is taught the Lean Method to take their start-up from raising investment to scale. Moreover, this course will provide hands-on training in the technologies and strategies used by small and large corporations in all aspects of running a start-up business.

ENTP 520 - Economics of Innovation

(3 semester hours)
Prerequisites: Graduate Standing
Description: This course introduces the role of innovation and technological change in business practice and economic growth. It analyzes sources of innovation in science, technology, and commercialization. Among others, the following

topics are covered: the founding of new industries and new markets, commercialization of new technologies, incentives and organization of science, openness and proprietary/controlled innovation. Moreover, selected public policies toward invention and innovation are considered.

ENTP 530 - Financial Sustainability

(3 semester hours)
Prerequisites: None
Description: Financial sustainability is the goal of every start-up and new business unit. Starting from a discussion of common business models, the course covers business models, financial projections, and pro forma statements., funding models, institutional venture capital investment, social entrepreneurship, crowdfunding, corporate investment, etc. The course also covers administrative, operations, and legal issues.

ENTP 699 - Applied Project in Techpreneurship

(3 semester hours)
Prerequisites: GRAD 695 and permission of instructor
Description: This course allows the student to pursue an area of interest that is within the broad scope of Techpreneurship. A faculty member will supervise this study.

GRAD 690 - Graduate Independent Study

(3 semester hours)
Prerequisites: None
Description: This course is designed for the student who demonstrates an interest in an area of study not offered or who wishes to pursue a discipline in greater depth than possible through existing courses. A learning contract between the student and instructor defines the responsibilities of the parties and specifies the learning objectives and standards for successful completion of the course.

GRAD 695 - Research Methodology and Writing

(3 semester hours)
Prerequisites: Completion of at least 18 graduate semester hours; must be taken prior to GRAD 699 or enrolled in one of the following graduate certificate programs: Biomanufacturing, Medical Biotechnology, or Regulatory-Legal Affairs in Biotechnology
Description: This course guides the student to develop and finalize a selected research problem and to construct a proposal that effectively establishes the basis for either writing a thesis or launching an experiential capstone project. The course provides an overview of strategies for effective problem investigation and solution proposal. Research methodology is studied and applied as part of suggesting a solution to a problem. Writing and formatting techniques are also explored and applied as a communication tool for cataloging the investigation and recommending the solution.

GRAD 699 - Graduate Thesis

(3 semester hours)
Prerequisites: GRAD 695 or permission of instructor
Description: In consultation with the advisor, the student conducts research designed in GRAD 695 to address a problem as identified in the solution proposal.

HCIN 500 - Healthcare Informatics

(3 semester hours)
Prerequisites: None

Corequisites: None
Description: This is the survey course for the Program in Healthcare Informatics, both for the certificate and the master's degree. The student is exposed to the full range of healthcare informatics as it is employed in today's workplace. This course discusses issues, trends, challenges, and applications related to the role of the Informaticist in Healthcare Systems and Institutions including big data management, electronic medical records systems, eHealth, data governance and data sharing. Case-based and project-based approaches are used for discussion and assignments. The student does not require academic healthcare system knowledge beyond that contained in ISEM541 Healthcare Systems, although clinical experience facilitates more rapid assimilation of content material and a deeper understanding of the overall curriculum. The overall goal of the course is familiarity with the potential contributions of informatics to both health outcomes and business operations so that successful learners return to their workplaces with sufficient knowledge to immediately function more effectively and efficiently as Informaticists. Cross-listed with ISEM 542.

HCIN 515 - Essential Informatics Skills I

(3 semester hours)
Prerequisites: None
Description: This is the first half of the keystone course for the Program in Healthcare Informatics, both for the certificate and the master's degree. The student engages in a 3-credit executive format course which provides them with a robust set of tools for devising customized potential solutions to a range of Healthcare Information Technology (HIT) implementation challenges facing healthcare systems today. Interactive sessions are needed to facilitate mastery of interpersonal skills. The goal of the course is familiarity with basic techniques and current best practices for the planning, evaluation, implementation, adoption and optimization of healthcare IT systems. The successful learner will be able to plan and execute HIT projects, facilitate change, communicate effectively with all staff, and intervene with problem adopters.

HCIN 520 - Essential Informatics Skills II

(3 semester hours)
Prerequisites: HCIN 515
Description: This is the second half of the keystone course for the Program in Healthcare Informatics, both for the certificate and the master's degree. The student engages in a 3-credit executive format course that provides them with a robust set of tools for devising customized potential solutions to a range of Healthcare Information Technology (HIT) implementation challenges facing healthcare systems today. Interactive sessions are needed to facilitate mastery of interpersonal skills. The goal of the course is familiarity with basic techniques and current best practices for the planning, evaluation, implementation, adoption and optimization of healthcare IT systems. The successful learner will be able to lead multidisciplinary teams, plan and execute HIT projects, work in an Agile/Lean environment, leverage adult learning theory, optimize the human-computer interface, and advise on HIT compliance issues.

HCIN 525 - Healthcare Case Studies Using Predictive Analysis

(3 semester hours)
Prerequisites: ANLY 512 or permission of the instructor
Description: This course is an elective course for graduate students studying Healthcare Informatics, Nursing, Pharmacy, Information Systems Engineering and Management, or Analytics and is intended to develop their understanding of using patient and administrative data to predict relevant outcomes and develop healthcare models. The course explores foundational concepts in data management, processing, statistical computing, and dynamic visualization. In this course, the student will investigate patterns, derive predictions in healthcare areas, and build models using selective predictive analysis techniques such as nonlinear regression, decision trees, probabilities, staffing models, queuing theory, event prediction, time series, rule-based modeling, and data visualization. The instructor will use case studies, and practical applications, small group projects, individual assignments, and a major course project to introduce students to simulations using existing data to master the various predictive models of healthcare analysis.

HCIN 541 - Healthcare Systems

(3 semester hours)
Prerequisites: None
Description: This course covers the basic principles, models and approaches of healthcare systems and introduces healthcare administration topics. The focus of the course is not on technologies but instead on the business and management aspects of healthcare. The course introduces the student to a wide range of healthcare topics such as healthcare business processes and business patterns, healthcare business process re-engineering and integration, healthcare clinical systems and services (patient care, physician support systems, health networks), hospital systems, management concerns, and government regulations. In addition, varied approaches and models of healthcare administration at local, national and international levels are discussed. Cross-listed with ISEM 541.

HCIN 545 - Healthcare Data

(3 semester hours)
Prerequisites: None
Description: This course addresses the central role of healthcare data in both health outcomes and business operations. This is the basic course in healthcare data management for the ISEM graduate program as well as the program in Healthcare Informatics, both the certificate and master's degree. The goal of the course is familiarity with basic techniques and current best practices for the governance, collection, cleaning, storage, sharing and handling of healthcare data. Case-based and project-based approaches are used for discussion and assignments. Prior experience in healthcare systems is not required, but knowledge of material contained in ISEM 541 Healthcare Systems is helpful in establishing context. Cross-listed with ISEM 545.

HCIN 550 - Introduction to Healthcare Analytics

(3 semester hours)
Prerequisites: None
Description: This is the analytics survey course for the Program in Healthcare Informatics, both for the certificate and the master's degree. Graduate students are exposed to the wide range of analytics tools and techniques used in today's workplace. The ultimate goal of the course is familiarity with the strengths and limitations of these tools so that successful learners return to their workplaces with sufficient knowledge to ask appropriate questions of the available data, choose the appropriate tools and techniques used to analyze the available data, and explain the strengths and weaknesses of any inferences made. Master's Degree students in Healthcare Analytics desiring more in-depth analytics application knowledge will pursue elective courses in ANLY. The student does not require mathematical knowledge beyond high school level algebra, although introductory calculus knowledge facilitates understanding in a few areas such as matrices, vectors, and rates of change.

HCIN 560 - Finance and Insurance Informatics for Healthcare

(3 semester hours)
Prerequisites: HCIN 545 and HCIN 550
Description: Healthcare finance is at the core of issues surrounding quality healthcare delivery and reform in the U.S. healthcare system. It involves balancing the need to manage/control costs, while simultaneously investing in strategic opportunities. This course emphasizes basic financial management theory related to the healthcare industry. This course also investigates the financial relationships between the healthcare provider, the patient, the employer group, and the payer (insurer). Course's focus is on budgeting, cost control, cost reimbursement, revenue, cost incentive programs, and financial analysis specific to healthcare. Moreover, healthcare billing practices from a variety of healthcare delivery systems are presented including an examination of insurance and reimbursement practices in terms of today's healthcare industry, and Medicare and Medicaid in terms of payment and governmental policy.

HCIN 699 - Applied Project in Healthcare Informatics

(3 semester hours)
Prerequisites: GRAD 695 or permission of instructor

Description: This course allows the student to pursue an area of interest that is within the broad scope of Healthcare Informatics. A faculty member will supervise this study.

HCID 500 - Design Perspectives

(3 semester hours)
Prerequisites: None
Description: This course will introduce the student to the design perspectives encountered most often in human-centered interaction design. Design perspectives are attitudes towards how to do design which reflect their political, social, and technological beliefs about design practice. Through readings and case studies, the student explores a variety of perspectives in the domain of digital interactive design. The student delves into the foundations of design practice through different standpoints, histories, frames of reference and interpretations of different views of the 'best' way to design.

HCID 504 - Qualitative Discovery Research

(3 semester hours)
Prerequisites: None
Description: This course will introduce the student to the package of study design and research methods employed within human-centered interaction design. In this process-driven course, the lessons will be structured around design research methodology, execution, and reporting. The course will take place as a series of situation studios, in which the student engages their evolving design eye and research skills to research the people, processes, contexts, and temporalities of digital interaction opportunities. Through readings, discussions, and the exploration of examples, guidelines, and heuristics, the course engages the student in the ethical and entrepreneurial aspects of design research within design practice.

HCID 510 - Theories of Human Interaction

(3 semester hours)
Prerequisites: None
Description: This course will introduce the student to the theories and perspectives of human social behavior that are employed most often in HCID. Drawing on canonical and new sociotechnical science literature, the course will present the student with overviews of theories of information, action, sociality, conflict, and interaction within traditional and digital environments. Through readings and examples, the course includes attention to sociotechnical theories around communities of practice, online communities, social media, and enterprise knowledge management. This seminar course offers the student a better understanding of the contexts and perspectives within which people interact with others, around and through offline, online, and hybrid environments.

HCID 520 - Users and Populations

(3 semester hours)
Prerequisites: None
Description: This course will introduce the student to the design-based theories and contexts of users and populations, as found in human-centered interaction design. The course will be structured around three design contexts: cohorts; environments; and capabilities. The course will take place as a series of case-based seminars. Through readings, discussions, and the exploration of examples and heuristics, the course draws the student's attention to the need to develop their design eye for contextual integration of user and population theory within design practice.

HCID 540 - Design Tools and Processes

(3 semester hours)
Prerequisites: HCID 510 and HCID 520 or permission of instructor

Description: This course offers the student the opportunity to work with a variety of tools and processes that support design practice. The course exposes the student to traditional and digital tools, templates, and techniques for design. Using an example project supplied by the professor, the course is run as a series of studios. After using tools and processes in each stage of the design process, the student reflects on the suitability and use case for each tool and reflect of their evolving sense of self as a designer. The course covers the tools, processes, and techniques necessary to professionalize the student's design practice.

HCID 570 - Design Patterns and Contexts

(3 semester hours)
Prerequisites: HCID 510 and HCID 520 or permission of instructor
Description: This course introduces the student to the contextual design of patterned interfaces in human-centered interaction design. The course is structured as a series of seminars around four design area: contexts; visuals; patterns; and actions. Taking the approach of goal-driven design, the student will engage in reading, discussing, experimenting, and presenting design rationales for design choices around traditional and new digital interfaces. The course builds on what the student learned in the other courses and intensifies the student's development of their design eye for contextually sensitive interaction design. The student will be challenged to consider areas of conflict and divergence within design thinking. While employing their own evolving capacity for design, the student will learn to manage conflicts between goal orientations, contextual needs, and environmental challenges.

HCID 680 - Special Topics in Human-Centered Interaction Design

(3 semester hours)
Prerequisites: Based on topic(s) covered or permission of instructor
Description: The in-program elective choices may vary each year, depending on needs and abilities of students, faculty, and external clients. Some co-teaching across the university's technology programs is expected to occur.

HCID 695 - Design Research Studio

(3 semester hours)
Prerequisites: Human-Centered Interaction Design major and completion of all core courses
Description: This course is a one-on-one student-focused research preparation studio. This course requires the student to conduct original research and document a design space within the domain of human-centered interaction design. The course is the first of two experiential learning classes for the completion of the HCID. The course will prepare the student for the GRAD699 portion of the degree, within which the student ideates, produce, and test a conceptual prototype that addresses the design problem identified through the research and analysis done in this studio course.

HCID 699 - Applied Project in Human-Centered Interaction Design

(3 semester hours)
Prerequisites: HCID 695
Description: In consultation with the academic and/or industry advisor, the student will execute on the findings and recommendations derived in HCID 695, towards a proof-of-concept of their work.

ISEM 500 - Strategic Planning for Digital Transformation

(3 semester hours)
Prerequisites: None
Description: This course introduces the basic principles (systems thinking and quantitative methods) of systems engineering and shows how these principles can be used to strategically plan, integrate, secure and administer the complex information systems that support and drive the current and future digital enterprises. Topics include: digital enterprises, aligning information technology strategy to business strategy, enterprise applications (customer relations

management, procurement, supply chain management), ecommerce, decision support, knowledge management, artificial intelligence (AI) applications, cost/benefit analysis and information technology infrastructure. These topics are explained through case studies and examples by using a strategic planning methodology.

ISEM 501 - Introduction to Digital Technologies

(3 semester hours)
Prerequisites: None *(This course is designed for the student that does not have a CS or IT background.)*
Description: This course provides the basic background in the rapidly advancing field of information and communication technologies (ICTs). It offers a rigorous overview of the current, as well as emerging, ICT building blocks that enable and drive modern enterprises. The first part of the course introduces the student to the key building blocks (enterprise applications, computing platforms, databases, and networks) of the modern IT infrastructure. The emphasis is on the Internet, broadband wired and wireless networks, classical Web, Semantic Web, XML, Web 2.0, social networking, and mobile computing. The second part of the course introduces the student to the main aspects of software development processes through hands-on projects. Basic software concepts are explored within this context by developing simple web sites using HTML and then using JavaScript, Java applets and XML to introduce more sophisticated features. The student has an opportunity to learn database technologies and run simple database queries using SQL.

ISEM 502 - User-Centered Design

(3 semester hours)
Prerequisites: None
Description: A high level of end-user and client involvement is absolutely critical in creating usable and effective software and technology that attracts audiences and/or generates revenue. User- centered design (UCD) describes an approach to business analysis and technology development that demands user interaction and user feedback in all stages of the development lifecycle. The UCD process involves a collection of activities and techniques that can be used to create the more usable, intuitive, and effective technology possible. This course covers the full range of UCD methods and demonstrates the importance of these techniques in designing and building interactive technology, focusing mostly on software applications.

ISEM 503 - Artificial Intelligence Principles and Applications

(3 semester hours)
Prerequisites: ISEM 500
Description: Interdisciplinary presentation of artificial intelligence as a coherent body of knowledge to acquaint the student with the key concepts and applications in business, science and engineering. The course covers models of intelligent behavior, including problem solving, knowledge representation, reason, planning, decision making, learning, perception, pattern recognition, action, communication and interaction. Recent developments in knowledge management, expert systems, computer-aided consulting and integrated intelligent systems are covered through a wide range of case studies, examples and hand-on experiments.

ISEM 515 - Commercialization of New Technologies

(3 semester hours)
Prerequisites: None
Description: This course is designed to prepare the student for taking innovations to the public marketplace. It is an introduction to a wide range of practical aspects, which are important to realizing the commercial potential of the innovation. Topics include corporate formation, team recruitment, intellectual property protection, supply-chain development, production and scaling, marketing and sales, media relations, venture capital markets, investor relations, social and business networks, organizational culture, and business development.

ISEM 520 - Service Science, Management and Engineering

(3 semester hours)
Prerequisites: None
Description: This course addresses Service Science, Management and Engineering (SSME) as a growing discipline that integrates aspects of established fields like computer science, operations research, engineering, management sciences, business strategy, social and cognitive sciences, and legal sciences.

ISEM 521 - Life Science for IT Professionals

(3 semester hours)
Prerequisites: None
Description: This course provides an ample spectrum of basic topics such as life science fundamentals, gradually leading to introduction to the interface between automation/IT applications for several fields of such as medicine, diagnostics, medical devices, agriculture, environment, food, pharmaceutics, and Nanobiotechnology. These topics allow the student to be introduced to an area of specialization in IT support, bioinformatics research or programming applications for the life sciences industry. The course starts with an overview of essential concepts of biological systems and proceeds to the structures and functions cellular macromolecules, particularly nucleic acids and proteins directly involved in storage and retrieval of biological information. After building a sound introduction to the basics of the living system, the course introduces the interface between these basic structures and applications of information technology to a variety of fields of applied life science.

ISEM 525 - Business Process Modeling and Workflow Systems

(3 semester hours)
Prerequisites: ISEM 500 or PMGT 510
Description: This course introduces the concepts of business process modeling and workflow systems in modern enterprises. In-depth modeling techniques used to capture business processes, workflows and conceptual information models are covered. Emphasis is placed on business modeling techniques such as the Business Process Modeling Notation (BPMN), business-use case modeling, Entity Relationship (ER) modeling, and other selected techniques from the Unified Modeling Language. The emphasis is on concepts and how these concepts are being used in practice by the most recent tools. The student develops business models to reflect case studies and real-world scenarios.

ISEM 528 - Industry Analysis and Technology Patterns

(3 semester hours)
Prerequisites: None
Description: Complex interdependencies exist between various industry sectors and emerging technologies. This course is designed to prepare the student for a broad understanding of industries and their dependence on emerging technologies. Topics include analysis of the key industry sectors in the digital age and an examination of their financial and logistical interdependencies. Focus is on industry ecosystem as the network of organizations - including suppliers, distributors, customers, competitors, government agencies, and others - involved in the delivery of a specific product or service through competition, cooperation, and organizational learning. Particular attention is paid to the role of substitute technologies that could disrupt an entire industry ecosystem. Several real-life case studies and examples with particular focus on supply chains will be used to illustrate the key points.

ISEM 530 - Systems Engineering Principles

(3 semester hours)
Prerequisites: ISEM 500
Description: This course prepares the student to analyze business information systems and to build models and logical designs that can be later implemented. The emphasis is on the business processes and business requirements needed to

build conceptual models that help in analysis of business requirements. This course prepares the student to design complex systems and build applied designs and architectures.

ISEM 534 - Database Design and Management

(3 semester hours)
Prerequisites: None
Description: This course emphasizes the practical aspects of the design and administration of modern Database Management Systems (DBMSs) that host enterprise data. Specific topics include the role of data in modern enterprises and the data life cycle that spans conceptual database design, database query languages such as SQL, database integrity rules, database administration, and data warehouses. This course utilizes commercially available relational DBMSs for hands-on experiments and explore how to create an entity-relationship data model, translate that model into relational schema, build and use a relational database that implements the schema, create SQL queries to retrieve and manipulate needed data, provide access to remote databases from web browsers, and experiment with DBA (Database Administration) capabilities. The student also investigates recent developments in database technologies (e.g. NoSQL). This course prepares the student for database design and administration positions and will also provide the necessary background for more specialized courses in database systems.

ISEM 536 - IT Infrastructure and Cloud Computing

(3 semester hours)
Prerequisites: ISEM 501 or permission of the instructor. *(This course is designed for the student that does not have a CS or IT background.)*
Description: This course concentrates on the practical aspects of Internet technologies, architectures and administration. Topics include: IT infrastructure, Internet Service Providers (ISPs), communications network principles, Internet Protocols, IPv4, IPv6, TCP sockets, and Internet of Things (IoTs). Administrative topics are network management, website administration, introduction to network security, wireless technologies and mobile computing. Classroom projects expose the student to network architectures for small to large enterprises. This course prepares the student for network planning administration positions and provides the necessary background for more specialized courses in communication networks.

ISEM 539 - Enterprise Architecture Frameworks

(3 semester hours)
Prerequisites: ISEM 500
Description: This course provides an overview of the common enterprise-wide architectural framework that drives business decisions regarding selection, implementation and management of ICT systems and solutions. In addition, different enterprise architecture frameworks are reviewed and the most commonly used framework - TOGAF (The Open Group Architecture Framework) - is examined in detail. The course topics include supporting and transforming Global Value Chains; e-business designs; creating an enterprise architecture; and the various methodologies, tools and techniques used in the design and implementation of the enterprise architecture. The course encompasses all aspects of information and communications technology, including data networks, applications, operating systems, database systems, telecommunications systems, and hardware components in the context of a total enterprise-wide framework.

ISEM 540 - Enterprise Architecture and Integration

(3 semester hours)
Prerequisites: ISEM 500
Description: Modern digital enterprises are characterized by increased automation, mobile services, extended B2B operations with global business partners, and on-demand business services. This course presents a 'systems' perspective based on service-oriented architecture (SOA) that combines processes, people and technologies, and highlights the role of information and communication technologies, enterprise models, and emerging SOA standards to develop flexible and integrated business architectures.

ISEM 541 - Healthcare Systems

(3 semester hours)
Prerequisites: None
Description: This course covers the basic principles, models and approaches of healthcare systems and introduces healthcare administration topics. The focus of the course is not on technologies but instead on the business and management aspects of healthcare. The course introduces the student to a wide range of healthcare topics such as healthcare business processes and business patterns, healthcare business process re-engineering and integration, healthcare clinical systems and services (patient care, physician support systems, health networks), hospital systems, management concerns, and government regulations. In addition, varied approaches and models of healthcare administration at local, national and international levels are discussed. Cross-listed with HCIN 541.

ISEM 542 - Health Informatics and Information Systems

(3 semester hours)
Prerequisites: Graduate Standing
Description: This course introduces the basic concepts of healthcare information systems and explains the role of information and communication technologies in current and future healthcare systems. The course reviews the role of different players in healthcare: providers, physicians, and insurance companies. Topics covered in healthcare informatics include: health information networks (HINs) at local, regional, national and global levels; information technology systems and applications; standards and interoperability topics; electronic health records (EHR) and EMR; clinical decision support; computer physician order entry (CPOE), and e-prescriptions, privacy and security concerns, financial/administrative systems, and examples of IT infrastructure for healthcare. Cross-listed with HCIN 500.

ISEM 543 - Digital Health

(3 semester hours)
Prerequisites: Graduate Standing
Description: This course explains the basic principles of e-Health and m (mobile)-Health through case studies and examples. The student is shown how to effectively develop and administer e-Health systems using web technologies. A wide range of case studies and examples of e-Health systems are used. The course also examines how wireless networks and mobile computing applications are used in healthcare informatics. The student investigates the latest developments in the field and identifies research topics of importance.

ISEM 544 - Social, Technical and Organizational Issues in Digital Health

(3 semester hours)
Prerequisites: Graduate Standing
Description: This course covers a wide range of socio-technical issues in healthcare information technologies. The focus is on the healthcare workplace as a dynamic system in which people, processes and technologies interact and influence each other. The course focuses on the people, processes and technologies related to important areas such as security and privacy, public policies and regulations, medical decision support systems and knowledge management in healthcare, electronic health records (HER), telemedicine systems, wireless sensor networks in healthcare, and others. Case studies and examples are used highlight practical aspects of socio-technical interactions.

ISEM 545 - Healthcare Data

(3 semester hours)
Prerequisites: None
Description: This course addresses the central role of healthcare data in both health outcomes and business operations. This is the basic course in healthcare data management for the ISEM graduate program as well as the program in Healthcare Informatics, both the certificate and master's degree. The goal of the course is familiarity with basic

techniques and current best practices for the governance, collection, cleaning, storage, sharing and handling of healthcare data. Case-based and project-based approaches are used for discussion and assignments. Prior experience in healthcare systems is not required, but knowledge of material contained in ISEM 541 Healthcare Systems is helpful in establishing context. Cross-listed with HCIN 545.

ISEM 547 - IT Management

(3 semester hours)
Prerequisites: ISEM 500 or permission of instructor
Description: This course introduces the core principles and practical methods and techniques for effectively managing Information Technology (IT) systems and organizations. The emphasis is on business and information technology for planning, investing, budgeting, assessing value and risks, as well as governing and securing Information Technology organizations and assets. Topics include management and leadership roles and challenges associated with IT manager in the digital enterprise, organizational design for flexible IT organizations, corporate and IT governance frameworks, IT policies and controls for the business, risk assessments and response planning, IT finance and budgeting, and the role of close-based IT services in modern organizations. Extensive practical exercises and case study method will be used throughout the course.

ISEM 550 - Cyber Security Management

(3 semester hours)
Prerequisites: ISEM 500
Description: This course covers the technical and administrative aspects of security, privacy and control that are vital to IS management. A comprehensive overview of security and IT control principles and practices that are needed to satisfy the IS systems integrity, confidentiality and availability requirements are addressed. Topics include security awareness, IS Security and Control Practices, IT audit principles and standards, risk analysis, and process-flow analysis for auditing.

ISEM 551 - Web-based Software Engineering

(3 semester hours)
Prerequisites: ISEM 501 or IT/CS background or degree
Description: This course is an introduction to web-based software engineering environments, design patterns, frameworks and key architectural aspects of robust enterprise applications. Topics for software development technologies include development languages and frameworks (e.g., .Net, Java, open-source), various tools used during the development lifecycle, and key components of an application in terms of the data, process and presentation layers. Architectural topics include prevalent design patterns such as model-view-controller (MVC), Web Services, and service-oriented architecture (SOA). The student uses computer-aided software engineering (CASE) environments and develops software architectures of real-life enterprise applications.

ISEM 555 - Mobile Computing and Wireless Communications

(3 semester hours)
Prerequisites: ISEM 500
Description: This course provides a management overview of wireless networking and mobile computing with a key focus on the building blocks and their inter-relationships.

ISEM 558 - IoTs and Industry4.0

(3 semester hours)
Prerequisites: Graduate Standing
Description: This course is an introduction to the area of Internet of Things (IoTs) with a special focus on Embedded

Systems and their applications. The course addresses a wide breadth of technologies and standards used to support this rapidly evolving domain. This includes the embedded system hardware, software, and operating systems. It also goes through wireless connectivity systems used for IoT, as well as the cloud support. The student will have an opportunity to explore current and future applications of IoTs and embedded systems in healthcare, energy, manufacturing, agriculture, transportation, and other vial sectors.

ISEM 560 - eGovernment and eCommerce

(3 semester hours)
Prerequisites: ISEM 500
Description: eGovernment and eCommerce (EG/EC) are changing the landscape of business. This course introduces the basic building blocks of EG/EC with an emphasis on strategies and applications and a brief discussion of the enabling technologies. The course provides a review of EC models and applications such as online purchasing, customer relationship management, electronic marketplaces, application service providers, supply chains, enterprise resource planning, and enterprise portals.

ISEM 561 - Public Administration

(3 semester hours)
Prerequisites: MGMT 511
Description: This course introduces the concepts of public administration with emphasis on key building blocks such as business processes, leadership, personnel management, budgeting, law enforcement and social welfare. The objective is to examine how public sector organizations work and how administrators can operate in such environments. The course covers the most important functions and processes of government agencies and non-profit organizations. The leadership strategies for increased public-sector effectiveness through the typical management processes of planning, organizing, monitoring, control and governance are discussed. The sources of public and non-profit revenue and expenditures are examined in the context of budget management. The topics of law enforcement management with public and non-profit managers are briefly reviewed with an emphasis on human resource accounting and personnel management. Public administrators are invited as guest speakers for local and global perspectives on these topics and to compare/contrast public agencies with their private sector counterparts.

ISEM 562 - Public Policy

(3 semester hours)
Prerequisites: Graduate Standing
Description: This course gives an overview of the broad field of public policy and examines the key concepts, theories and practical operational methods of public policy. The course presents with an examination of the core concepts in the formulation, implementation, and impact of public policy and covers the role of administrative law in the formulation, implementation and evaluation of public policy. The ethical arguments inherent in public policy decisions and compliance with legislated ethical standards are examined. The policies, politics and administrative activities of federal, state, and local levels are considered. The interaction of the public sector, the private sector, and citizen groups in the implementation of environmental policy is discussed and the role of planning process as a decision-making tool in the implementation of public policy is examined. The course uses a wide range of national and international policy examples in areas such as housing and community development, social welfare, employment programs, transportation, the internet and telecommunications.

ISEM 564 - Big Data and Machine Learning

(3 semester hours)
Prerequisites: ISEM 501 or ISEM 534, or permission of instructor
Description: This course introduces the main concepts of big data with focus on applications of big data and data sciences in business settings. The student explores several Open Big Data (OBD) sources and investigates applications of OBD in health, education, public safety, public welfare and other vital sectors. Through hands-on experiments, the

student develops a significant understanding of data science and practical applications of big data. Some tools used by practitioners of data science and analytics are introduced but sophisticated mathematical or programming background is not required.

ISEM 565 - Business Intelligence and Decision Support Systems

(3 semester hours)
Prerequisites: ISEM 500
Description: Modern "electronically enabled" enterprises rely increasingly on knowledge that needs to be managed and processed through a variety of intelligent tools. This course covers business intelligence and knowledge management in modern enterprises and discusses how the decision support and expert systems tools can be used for effective decision making in organizations.

ISEM 568 - Aligning Business Strategy with IT Strategy

(3 semester hours)
Prerequisites: ISEM 500
Description: This course discusses how the information technology (IT) strategy can be aligned with business strategy to compete and become successful. The focus is on the major elements of the business and IT strategic management models and their inter-relationships. Different alignment models such as the Henderson-Venkataraman model are discussed in detail through case studies.

ISEM 570 - IT Quality Assurance

(3 semester hours)
Prerequisites: ISEM 500 or permission of the instructor
Description: The information technology product is central to most business systems. Quality of the product is represented by accuracy, reliability, repeatability and specific customer requirement standards. Various techniques to understand the quality control processes and quality assurance measures are demonstrated and industry standards and protocols are covered.

ISEM 572 - Smart Cities and Strategic Intelligence

(3 semester hours)
Prerequisites: ISEM 500 or permission of instructor
Description: This course addresses advances in research, technologies, systems, and applications as related to "strategic intelligence." Strategic intelligence (SI) refers to the intersection of Business Intelligence, Knowledge Management, and Competitive Intelligence for improving the strategic decision making in Smart Cities. Instead of intelligence on one topic area, smart cities need strategic intelligence that covers multiple topic areas. This course discusses methodologies, trends, challenges, and applications as related to knowledge management, intelligent systems, automated planning and scheduling systems, analytics, and Big Data.

ISEM 574 - Bitcoin Blockchain

(3 semester hours)
Prerequisites: Graduate Standing (ISEM 550 recommended)
Description: Bitcoin and its underlying blockchain technology are disruptive innovations which are having a major impact on the financial industry and other industries. This course provides a technical introduction to Bitcoin, Blockchain, cryptography, keys and addresses, wallets, transactions, decentralized consensus, mining, and other Bitcoin technologies.

ISEM 575 - Ethereum Blockchain

(3 semester hours)
Prerequisites: ISEM 574 or NGEN 520 or permission of instructor.
Description: Ethereum is an exciting alternative to Bitcoin that provides support for Smart Contracts and Decentralized Applications (DApps) that are not possible to create on Bitcoin. This course offers not only a core developer experience for the Ethereum platform with Web3 and the Solidity programming language, but also offers a comprehensive survey of how the Ethereum platforms have contributed to a completely new offering of DApps. Topics that are covered include Metamask wallet, Remix integrated development environment, transactions, keys and addresses, decentralized consensus, oracles, tokens, smart contract security, and other Ethereum technologies. Cross-listed with NGEN 534.

ISEM 576 - Cryptocurrency and Regulation

(3 semester hours)
Prerequisites: None
Description: After the emergence of Bitcoin, thousands of cryptocurrencies have surfaced with a vast supportive infrastructure for exchange of this value. This has resulted in diverse responses from governments and other regulating bodies. This course contains a comprehensive history of crypto assets and infrastructure, including exchanges, wallets, tokens, central bank-issued digital currencies, and the state of regulations. This course gives the student an introduction of blockchain assets, as well as explain how government jurisdictions are responding to this unique disruption. Cross-listed with NGEN 525

ISEM 577 - Blockchain Scalability

(3 semester hours)
Prerequisites: NGEN 520 or ISEM 574 or permission of instructor
Description: Blockchain Technology has ushered in a range of blockchain technologies. Different blockchains have selected different trade-offs in terms of scalability, interoperability, and decentralization. This course begins with a basic introduction to growth challenges faced by blockchains and how that has evolved in the blockchain ecosystem. This course describes different approaches to scalability including the Lightning Network, channels, sidechains, plasma, rollups, appchains, and hyperchains. Cross-listed with NGEN 540

ISEM 578 - Decentralized Finance

(3 semester hours)
Prerequisites: NGEN 520 or ISEM 574 or permission of instructor
Description: Blockchain is a fundamental disruption in the history of ledger technology, and it will deeply impact the future of all ledger-centric institutions such as central banks, commercial banks, companies and exchanges, as well as the currencies and assets that are transacted and traded inside them. This course covers Decentralized Finance (DeFi), the innovations and risks of DeFi, the range of existing DeFi applications and protocols, the extent to which DeFi is disrupting traditional finance, Fungible Tokens and Non-Fungible Tokens (NFTs), and Central Bank Digital Currencies (CBDCs). Cross-listed with NGEN 560

ISEM 580 - Special Topics in Information Systems Engineering and Management

(3 semester hours)
Prerequisites: None
Description: This course explores a topic or collection of topics of special interest that is timely and in response to critical or emerging topics in the broad field of information systems engineering and management. Due to the nature of evolving topics, this course may not be eligible for repeat.

ISEM 581 - Independent Study in Information Systems Engineering and Management

(1 to 3 semester hours)
Prerequisites: None
Description: This course is designed for the student who demonstrates an interest in an area of study not offered or who wishes to pursue a discipline in greater depth than possible through existing courses. A learning contract between the student and instructor defines the responsibilities of the parties and specifies the learning objectives and standards for successful completion of the project. A calendar of meeting times and deadlines shall be a part of that contract.

ISEM 620 - Graph Databases and Applications

(3 semester hours)
Prerequisites: ISEM 540 or permission of the instructor
Description: This course serves as an in-depth investigation of Graph Databases, with some study of multi-model database systems. Primary emphasis will be given to graph databases and graph database applications. The student will perform database selection, database design, graph query creation, and graph database application programming to address the needs of data-intensive applications in smart organizations.

ISEM 699 - Applied Project in Information Systems Engineering and Management

(3 semester hours)
Prerequisites: GRAD 695 or permission of instructor
Description: This course allows the student to pursue an area of interest that is within the broad scope of Information Systems Engineering and Management. A faculty member will supervise this study.

ISEM 700 - Smart Enterprises and Strategic Intelligence

(3 semester hours)
Prerequisites: Admission to ISEM Doctoral Program
Description: Smart Enterprises are the next generation of digital enterprises that heavily rely on artificial intelligence (AI) to deal with customers, suppliers/partners, government agencies and employees. This course highlights advances in research, technologies, systems, and applications as related to intelligent digital enterprises such as smart cities, smart towns, smart healthcare, smart islands, industry4.0, and automated planning environments. The emphasis is on "strategic intelligence" (SI) that refers to the intersection of Business Intelligence, Knowledge Management, and Competitive Intelligence for improving the strategic decision making in Smart Enterprises. Instead of intelligence on one sector, SI concentrates on intelligence that cuts across multiple sectors. The course uses case-based and project-based approaches for discussion and assignments, but the focus is on research directions in this broad area of work. The student is expected to produce a research paper as the final output of this course.

ISEM 705 - Advanced Design Project

(3 semester hours)
Prerequisites: Completion of 12 credits in the Advanced Studies Program or Admission to ISEM Doctoral Program
Description: This course goes beyond the master's level capstone courses and concentrates on the design of complex intelligent systems in modern settings. Instead of behavioral research approaches, the emphasis is on design science approach, where artifacts are designed based on iterative prototyping, modeling, and simulation techniques. In addition to a written document that catalogs the investigation, a demonstration of the proposed design is required through gamifications and/or actual operational prototypes. A student who has developed a system design in ISEM capstone may implement or further enhance and enrich his/her design in this course.

ISEM 706 - Research Methods in Information Systems Engineering and Management

(3 semester hours)
Prerequisites: ISEM 580-Special Topics: Introduction to Research Methods and Admission to ISEM Doctoral Program,

or permission of instructor
Description: This course builds on the introduction to research methods provided in GRAD 509 to examine and practice advanced methods of research and study design. The aim of this course is to learn and use the research methods and techniques relevant to Quantitative, Qualitative and Design Science research. Topics covered include research theorizing and model development, instrument development and validation, multivariate techniques, experimental design, structural equation modeling, qualitative research design, data analysis and implementation strategies, grounded theory approach, and significant study of design science research.

ISEM 710 - Knowledge Engineering

(3 semester hours)
Prerequisites: Completion of all 500-level Breadth courses and ISEM 706, or permission of instructor
Description: This course concentrates on research and methods relevant to the analysis, critique, and creation of structures and formalisms for the acquisition, representation, distribution, and application of knowledge in intelligent and increasingly digitally and computationally driven organizations. Topics will include, but not limited to, ontologies and ontology engineering, genetic algorithms, fuzzy logic and reasoning, knowledge-based systems, explainable AI, taxonomies, Web X.0 formalisms, hybrid AI-KBS approaches (e.g., neuro-symbolic AI), knowledge graph construction and general knowledge-driven computing for the solution of complex problems.

ISEM 712 - Cyber-Physical Systems

(3 semester hours)
Prerequisites: Completion of all 500-level Breadth courses and ISEM 706, or permission of instructor
Description: This course focuses on theories and issues surrounding the design and implementation of complex cyber-physical systems. Topics covered will encourage a command of models and theories, i.e. mathematical, organizational and/or cognitive, that underlie the design, construction, verification, control, and interaction of computational and physical components of systems in multiple areas of application, such as agriculture, healthcare, supply chain, and manufacturing.

ISEM 715 - Systems Science

(3 semester hours)
Prerequisites: Completion of all 500-level Breadth courses and ISEM 706, or permission of instructor
Description: This is a research-focused course that demands extensive student research (readings), academic writing and presentation. This course introduces the student to the discipline of "Systems Science", which is characterized by multiple definitions but represents a field of scientific inquiry focused on the study of "systems". The concept of "System" is introduced and discussed in a mathematical form. The relationship between mathematics, computer technology and systems science is also explored. Conceptual frameworks within which to characterize Systems Science are discussed. A Systems Methodology is presented as a guide within which to address system problems, including the development of systems models. The topics of complexity and complexity reduction are also discussed. The history and the current future states of Systems Science research are also explored.

ISEM 720 - Advanced Applications of Satellite Systems

(3 semester hours)
Prerequisites: Completion of at least 18 graduate semester hours and good knowledge of Web Technologies (equivalent to ISEM 501) or a degree in IT/software engineering/computer science or Admission to ISEM Doctoral Program
Description: This course covers major aspects concerning the field of advanced applications of satellite systems and remote sensing data. These satellites can be classified by their function since they are launched into space to do a specific job and hence the satellite must be designed specifically to fulfill its role. The focus of the course is on large and complex applications of satellites and remote sensing data in Health, Public Safety (e.g., disaster recovery), Public Welfare (e.g., economic development), Energy, Environment, Tourism, Agricultures, Smart Cities, and other satellite

application areas such as weather forecasting and satellite radios/TV. After an introduction to satellite technologies, this course concentration on innovative satellite applications to solve real life problems.

ISEM 725 - Advanced Business Process Modelling and Intelligence

(3 semester hours)
Prerequisites: Admission to ISEM Doctoral Program
Description: In-depth coverage of current practical, conceptual, and theoretical techniques of process modeling, simulation, and intelligence. Primary emphasis is given to understanding and applying various modeling techniques and languages (such as BPEL), types of simulations (such as discrete event simulation), and to using various techniques and tools (such as PROM) to develop data-driven models/prescriptions of process models. All the foregoing will be considered within the context of the development of solutions to both practical and cutting-edge problems. The student conducts a focused literature review on some advanced aspect of the studied material and issues.

ISEM 730 - Advanced Systems Engineering

(3 semester hours)
Prerequisites: Admission to ISEM Doctoral Program
Description: This course introduces the student to the discipline of "Large Scale Systems Engineering". Also referred to as "Requirements Driven Development" as well as "Systems Engineering", it represents a disciplined technical and management process by which abstract complex problem descriptions are successfully transformed into fully developed, tested and deployed systems. Discussed are the "art" and "science" of the Large-Scale Systems Engineering discipline. Evolution of Systems Engineering and Advances in Systems Science are discussed. Specialized concepts involved in developing human-engineered complex systems are reinforced primarily through student research and writings. This is a research-focused course that demands extensive student research and academic writing as well as advanced mathematical techniques such as optimization and stochastic processes.

ISEM 735 - Advanced Applications of Machine Learning and Deep Learning

(3 semester hours)
Prerequisites: Completion of at least 18 graduate semester hours and knowledge of Machine Learning/Deep Learning approaches/applications (equivalent to ISEM 503 or ANLY 530) or Admission to ISEM Doctoral Program
Description: This course concentrates on how the latest thinking/ideas/applications in Machine Learning/Deep Learning (ML/DL) can be used in large scale and complex enterprise problems. Instead of exploring new ML/DL algorithms and techniques, this course explicitly focuses on advanced applications of ML/DL techniques to solve digital enterprise problems that span Health, Education, Public Safety, Public Welfare, Utilities, Smart Cities and Communities, B2B Networks, and other Industrial Eco-systems. The students will select an applied research problem that could be possibly published as a conference paper and/or demonstrated as a solution prototype.

ISEM 740 - Enterprise Engineering

(3 semester hours)
Prerequisites: Completion of all 500-level Breadth courses and ISEM 706, or permission of instructor
Description: This course recognizes that the systems that we call enterprises must be (re)designed and (re)engineered. This course will provide an opportunity to gain fluency in theories and techniques of enterprise engineering through a study of enterprise ontology, modelling, and organizational design.

ISEM 745 - Research in Industry Analysis and Technology Patterns

(3 semester hours)
Prerequisites: Completion of all 500-level Breadth courses and ISEM 706, or permission of instructor
Description: This course will provide the tools and knowledge necessary for students to conduct analyses of single- and

cross-industry ecosystems. After a brief review of existing tools, such as Porter's Five-Forces model, PEST analysis, and SWOT analysis, the course will turn to the use of various databases, research, and other sources of data, information and tools that allow description and prediction of industry trends and technologies that course shape industrial, socio-technical, and societal forces and outcomes.

ISEM 750 - Simulation Modeling and Analysis

(3 semester hours)
Prerequisites: Completion of all 500-level Breadth courses and ISEM 706, or permission of instructor
Description: Simulations and simulation tools provide a valuable means for modeling and analyzing complex systems, especially when analyzing real-world systems and objects which are not amenable to manipulation or data collection. This course will provide in-depth exposure to simulation modeling, simulation software, simulation analysis, relevant probability distributions, agent-based modeling and simulation, system dynamics, discrete-event simulation, and multi-method modeling.

ISEM 755 - Smart Cities, Societies, and Governments

(3 semester hours)
Prerequisites: Completion of all 500-level Breadth courses and ISEM 706, or permission of instructor
Description: This course will concentrate on smart cities, societies and governments as human cyber-physical systems. Students will use theory, concepts and techniques to investigate large-scale human collectives as "sociotechnical ecosystems of people, technology, organizations, and information." (Cassandras, C. (2016). Engineering, vol. 2 (2)). Topics will include, but not be limited to, big city data, sensing and sensors, IoTs, smart grids and energy, smart services, information and data ethics, smart transportation, and dynamic resource allocation.

ISEM 760 - Advanced Topics in Operations Management

(3 semester hours)
Prerequisites: Admission to ISEM Doctoral Program
Description: This course discusses how Operations are designed in modern digital organizations and how managers can use Information Technology (IT) to support these operations. Business operations in modern organizations are defined based on business strategies. The main focus of this course is to learn a) how business strategies are designed and implemented, b) how business operations are defined and managed, and c) how IT is used to enable the business operations. Recent research and industry trends in the field of operations management are discussed in some detail. The course systematically guides the student to conduct a focused literature review on some advanced aspect of the studied material and produce a research paper. The student uses hands-on tools for practical insights.

ISEM 770 - Advanced Topics in ISEM

(3 semester hours)
Prerequisites: Completion of 12 semester hours of Breadth or Depth doctoral courses
Description: This course discusses overall research and industry trends in intelligent digital enterprises, industry4.0, intelligent planning and scheduling systems, next generation of digital infrastructure, business models, systems engineering, and other extant areas of work such as artificial intelligence, big data and analytics. The exact topics discussed will change with time. The main focus is on guiding the student to emerging relevant trends and to expose the student to a repository of potential "Ph.D. hard" questions (i.e., the questions that require Ph.D. level research).

ISEM 780 - Doctoral Research Seminar

(3 to 6 semester hours)
Prerequisites: Completion of all Breadth and Depth course requirements; pass qualifying examination
Description: This course provides support to the doctoral student within their specific domains of research. Led by the

faculty advisor for that domain, the course is designed to provide a forum where faculty and the student can come together to discuss, support, and share the experiences of working in research. Research topics in the broad area of information systems engineering and management are discussed. Topic areas may concentrate on industry sectors (e.g., health, education, manufacturing, transportation, energy, environment, agriculture and others), emerging digital technologies and their impacts on the digital enterprises, and/or latest developments in systems engineering principles such as planning, architectures, integration, engineering/re-engineering, and engineering management. Each topic area will be studied in-depth to educate the student in conducting independent research. May be repeated for credit.

ISEM 799 - Doctoral Studies (Thesis)

(6 semester hours)
Prerequisites: ISEM 780; pass comprehensive examination
Description: Advancement to candidacy is a prerequisite of this course. This is an individual study course for the doctoral student that culminates in a Ph.D. Thesis. Content to be determined by the student and the student's Doctoral Committee. May be repeated for credit.

ITPM 515 - Business and Requirements Analysis Fundamentals

(3 semester hours)
Prerequisites: None
Description: This course is designed to help the student prepare for a career in management, building on their technical and professional background and education. The field of business analysis is a fast-growing profession that offers a global certification. Business analysis is a key function on a project team that promotes understanding of what the customers want the project team to build for them; it is essential to project success. Through the use of real life project examples, the student gains expertise in planning, eliciting, writing, and managing customer requirements for IT and other types of projects. Cross-listed with PMGT 515.

ITPM 580 - Special Topics in IT Project Management

(3 semester hours)
Prerequisites: None
Description: This course explores a topic of special interest that is timely and in response to a critical topic in the field of technology project management. Due to the nature of evolving topics, this course may not be eligible for repeat.

LTMS 500 - Macro Instructional Design

(3 semester hours)
Prerequisites: None
Description: This course focuses on the use of an instructional design process to improve learning outcomes, with an emphasis on the analysis components of instructional design that create a foundation for successful learning solutions. The course explores tools and techniques for analysis, design, development, delivery and evaluation and addresses strategies that can be enhanced by technology integration. The goal of the course is to establish a systematic process for designing instruction and explores trends and technology integration opportunities throughout the process.

LTMS 501 - Active Learning Planning

(1 semester hour)
Prerequisites: None
Description: This course focuses on the research and evidence that supports the role of movement in learning, memory, attention and concentration. A course participant creates an active learning intervention plan for the school setting, which is reviewed by experts in the field. Upon completion, the student receives the Active Learning Specialist certificate. This course is delivered in an online, asynchronous format with new cohorts of students starting the online

course each semester with a one-month rolling start date. Course completion takes approximately 30 hours over 5 to 10 weeks. Thirty (30) hours of asynchronous contact time equates to 15 hours of standard contact hours or 1 graduate semester hour. *This course is intended for current teachers, pre service teachers, administrators, athletic coaches, nutrition experts, and parents serving on a school board.*

LTMS 503 - Raspberry Pi in the STEM Classroom

(3 semester hours)
Prerequisites: None
Description: Uses of the Raspberry Pi in the STEM Classroom are explored. Topics include teaching the Linux operating system to students, uses of the various programming languages in the PI, including Scratch, Sonic Pi, and Python. An introduction to physical computing within several curricula in an integral part of the class. The student will be expected to purchase a Raspberry Pi 3B starter kit.

LTMS 505 - Digital Security for Instructional Technology Specialist

(3 semester hours)
Prerequisites: None
Description: If you are a certified Instructional Technology Specialist you need to be aware of a variety of cybersecurity issues that become more important day by day. This class will cover topics in the 5 areas of cybersecurity defined by NIST: Identify, Protect, Detect, Respond and Recover, as well as school specific security concerns.

LTMS 507 - Implementing Google Tools in the Classroom

(3 semester hours)
Prerequisites: None
Description: This class explores the use of applications within the Google G Suite for education and Google Chromebooks in a school environment. Course topics include the use of the tools to foster individual creativity, collaboration, and presentation skills within a constructivist educational paradigm. This course is taught by Google certified educators and requirements for Google certification are presented.

LTMS 509 - Implementing Microsoft Tools for Education

(3 semester hours)
Prerequisites: None
Description: This class explores the use of applications within the Microsoft Tools for Educator in a school environment. Course topics include the use of the tools within Office 365 to foster individual creativity, collaboration, and presentation skills within a constructivist educational paradigm, including the use of Skype as a collaboration tool in the classroom. This course is taught by Microsoft certified educators and requirements for Microsoft certification are presented.

LTMS 510 - Learning Technologies and Solutions

(3 semester hours)
Prerequisites: None
Description: This course presents an overview of multiple technology-based solutions to realize learning outcomes. Beyond a survey of learning software, the course challenges the student to think broadly about emerging technology trends that present opportunities. By establishing a systematic decision analysis process, the student is able to assess suitable technology tools for specific environments and learning needs. A broad survey of open source and proprietary solutions are explored, as well as emerging trends in learning technologies. Course topics are examined within a framework of a learning strategy and a learning architecture.

LTMS 514 - Media Selection, Design and Production

(3 semester hours)
Prerequisites: None
Description: This course focuses on creating media for learning solutions. Selecting appropriate media to meet learning objectives are explored as the student creates graphics, illustrations, audio, video, and animations to support learning. Graphic design fundamentals are addressed, in addition to production skills like media compression and conversion. Industry leading media software and open source options are considered.

LTMS 515 - History of Instructional Technology

(3 semester hours)
Prerequisites: None
Description: This course explores the history of instructional technology, and the instruction design practices reflected in that history. Topics include the origins of programmed instruction as practiced by BF Skinner and Norman Crowder, the PLATO system as the first large scale educational technology platform, the Apple II and other early microcomputers, Seymour Papert and the move to cognitivist instruction, Window systems and finally, the Raspberry Pi as an example of the latest STEM based instructional platform.

LTMS 518 - eLearning Development

(3 semester hours)
Prerequisites: None
Description: This course presents content creation software that can be used for eLearning. The student creates eLearning modules that focus on navigation, usability and compliance to content standards. Planning and asset management are also explored as elements of efficient eLearning development. Industry leading software and open source options are considered.

LTMS 520 - Learning Evaluation and Assessment

(3 semester hours)
Prerequisites: LTMS 500
Description: This course focuses on measuring multi-modal learning and performance with an emphasis on the use of technology as an evaluation and assessment tool. Course evaluation and learner performance are both explored as formative and summative assessment, authentic assessment, subjective and objective assessment, criterion-referenced and norm-referenced assessment, formal and informal assessment, testing and evaluation standards, analytics and metrics, the importance of validity and reliability, and the use of technology in the evaluation and assessment process.

LTMS 525 - Learning Theories and Instructional Strategies

(3 semester hours)
Prerequisites: None
Description: This course is an in-depth exploration of learning theories including, but not limited to, behavioral modeling, cognitive processing, metacognition, motivation, social learning, constructivism and connectivism. Culture and learning, brain research and the integration of technology to support learning theories are also explored. Theories and practices are examined within the context of creating instructional strategies as part of learning design with a focus on technology-supported learning solutions.

LTMS 530 - Managing Technology Resources

(3 semester hours)
Prerequisites: LTMS 510

Description: New technologies are changing instruction and placing new demands on technology professionals that support learning technologies. This course addresses the challenge of providing access to educational technologies while balancing security and resources in learning environments. The course establishes strategies for assessing, planning, implementing, supporting and governing learning technologies with a focus on maximizing the instructional value of technology investments.

LTMS 531 - Designing Serious Games and Simulations

(3 semester hours)
Prerequisites: LTMS 500
Description: This course focuses on applying game and simulation design strategies to increase context, motivation, engagement and learning outcomes. Character development, narrative, user interface, game play, game balancing, principles of level design and feedback in games and simulations are applied as the student designs a game or simulation to achieve a learning goal. The differences and similarities between game and simulation concepts, genres and worlds are examined, in addition to game and simulation intricacies for specific groups and game production and management.

LTMS 532 - Developing Serious Games and Simulations

(3 semester hours)
Prerequisites: LTMS 514 and LTMS 531
Description: This course presents tools and techniques for developing serious games and simulations. Programming and scripting languages, simulation systems, programming fundamentals, game architecture, navigation, usability, feedback, data management, artificial intelligence, media programming and developing for multiplayer environments are explored as the student develops the design from the "Designing Serious Games & Simulations" course. Game production and management with a focus on the game development phase are also discussed.

LTMS 533 - 3-D Modeling and Design

(3 semester hours)
Prerequisites: LTMS 514
Description: This course develops skills in computer-generated 3D modeling and design with a focus on basic 3D concepts, animation concepts and physics, scene management, modeling, mesh, materials and mapping. A focus is given to lighting, physics, and particle emitters as part of object development and animation. 3D rendering options and preferences are also examined. A discussion of 3D production and management requirements is also explored.

LTMS 535 - Critical Issues in Biology Education

(3 semester hours)
Prerequisites: LTMS 500 and LTMS 510
Description: This course addresses topics in biology education that combine current priorities in science and the need of the society. Topics such as biological knowledge, scientific methods, and career awareness are covered. This course also surveys the biology education landscape to identify topics in K-12, postsecondary and professional biology education that are impacting interest and achievement in STEM education and how interactive learning experiences such as games and simulations can address the student motivation and cognition challenges for improved learning outcomes.

LTMS 536 - Applied eHealth Communication

(3 semester hours)
Prerequisites: LTMS 500 and LTMS 525
Description: This course focuses on developing a foundational knowledge of theory-based methods in health

communication and the application of those methods to creating health communication products that influence awareness, knowledge, attitude, and behavior within a target audience. The course examines successful case studies in health communication and the stages of health communication product development (audience assessment, product planning, development, testing, revision, and implementation) as they apply to eHealth Communication.

LTMS 540 - The Instructional Designer as Entrepreneur

(3 semester hours)
Prerequisites: completion of 15 graduate-level credits and Learning Technologies Major
Description: This course focuses on the evolution of the profession of instructional designer from one customarily employed by a corporation to one where the instructional designer is most frequently an independent contractor. The focus is on the effect this has on the required skillset and mindset of the designer. The course explores tools and techniques for finding work, evaluating requests for proposals, writing proposals, meeting with selection teams, and building strategies that can be enhanced by technology integration. The goal of the course is to establish a systematic process for designing the workflows, processes, and skillsets needed to build an instructional design consultancy.

LTMS 544 - Critical Issues in Teaching Mathematics

(3 semester hours)
Prerequisites: LTMS 500 and LTMS 510
Description: This course explores the integration of learning technologies into a math curriculum. Emerging opportunities in learning technologies for active learning, applied math, data visualization, media solutions and assessment are investigated. Promoting math careers and supporting professional development through the use of learning technologies are also explored.

LTMS 580 - Special Topics in LTMS

(3 semester hours)
Prerequisites: None
Description: This course explores a topic of current interest in the field of learning technology. Due to the nature of evolving topics, this course may not be eligible for repeat.

LTMS 598 - Critical Issues in Teaching Science

(3 semester hours)
Prerequisites: LTMS 500 and LTMS 510
Description: This course explores the integration of learning technologies into a science curriculum. Emerging opportunities in learning technologies for active learning, virtual labs, data visualization, media solutions and assessment are investigated. Promoting science careers and supporting professional development through the use of learning technologies are also explored.

LTMS 599 - Critical Issues in Teaching Technology

(3 semester hours)
Prerequisites: LTMS 500 and LTMS 510
Description: This course explores the integration of learning technologies into a technology curriculum. Emerging opportunities in learning technologies for active learning, virtual computer labs, media solutions and assessment are investigated. Promoting technology careers and supporting professional development through the use of learning technologies are also explored.

LTMS 609 - Synchronous Facilitation

(3 semester hours)
Prerequisites: LTMS 500
Description: This course is an in-depth discovery of planning, producing and facilitating synchronous face-to-face and online communication and learning events. Classroom facilitation techniques are examined, in comparison and support of developing online facilitation skills. Creating audience engagement with effective content development, media and interactive elements in an online synchronous session are addressed. The producer's role in facilitator and participant preparation, technology validation, logistics, in-session troubleshooting and post-session follow-up is also examined. Industry leading web conferencing and virtual classroom software and open source options are both considered.

LTMS 610 - Learning Technologies Project

(3 to 6 semester hours)
Prerequisites: Learning Technologies Major
Description: The student creates and executes a detailed project plan to use as part of a real-world project that applies concepts and skills previously explored throughout the program. The student's project is customized to a particular area of interest in learning technologies. This experiential course also provides an opportunity to reinforce and demonstrate the eight University competencies, i.e., critical thinking, communication, teamwork and collaboration, entrepreneurship, information literacy, ethical decision making, global awareness, and civic engagement.

LTMS 614 - Social Learning in the Organization

(3 semester hours)
Prerequisites: None
Description: This course explores the use of social learning and communication in organizations, the software tools used to enable online social interaction and the challenges of organizational implementation. Social learning technologies enable conversations, content creation, connections and collaboration in the organization. When socially-enabled, these activities can increase productivity, deliver knowledge at the time of need and address time and location challenges that exist in today's organizations. The student identifies a learning or communication opportunity to create a solution using social learning technologies. Open source and industry leading hardware and software options are both considered.

LTMS 615 - Coordinating the Learning Technology Infrastructure

(3 semester hours)
Prerequisites: LTMS 530
Description: This course focuses on identifying, selecting, installing and maintaining a technology infrastructure to support technology-enabled learning solutions. Administrative and educational technology needs along with the need for assistive technology resources to support learners with special needs are specifically addressed within the examination of the overall infrastructure.

LTMS 618 - Accessibility Software and Devices

(3 semester hours)
Prerequisites: LTMS 500
Description: This course is a study of software and hardware devices that are used to address accessibility requirements. Design fundamentals, built-in accessibility development functions, scripting solutions, accessibility devices and alternative delivery methods are explored in the context of achieving compliance with the 1998 amendment to Section 508 of the Rehabilitation Act of 1973 requiring electronic and information technology accessibility by government and government-subsidized organizations for persons with disabilities.

LTMS 636 - Micro Instructional Design

(3 semester hours)
Prerequisites: LTMS 500, LTMS 510, and either LTMS 514 or LTMS 518
Description: An in-depth exploration of instructional design strategies and techniques are explored in a project-based group environment. Selecting media, identifying learning objectives, writing assessment instruments and creating a detailed instructional plan are examined as part of the complete design and development of a learning solution.

LTMS 645 - Visual Representation for Learning and Communication

(3 semester hours)
Prerequisites: LTMS 514
Description: This course explores the benefits of visually representing ideas, concepts and processes to improve the results of learning and communication. The history of visualization for learning and communication, along with the current research and trends in using visuals to improve learning and communication, are explored. Techniques and technologies for brainstorming, mind mapping, creating instructional and curricular design, thinking creatively, planning, creating visuals and delivering visual learning and communication are applied in individual and group projects throughout the course.

LTMS 680 - Advanced eLearning Development

(3 semester hours)
Prerequisites: Permission of Instructor
Description: An in-depth exploration of advanced eLearning application development is explored in a project-based group environment. Interactivity, personalization, data flow and management and system integration are examined as part of developing an advanced eLearning application.

LTMS 697 - LTMS ePortfolio

(0 semester hour)
Prerequisites: None
Description: A graduate student pursuing the Pennsylvania Department of Education Instructional Technology Specialist (ITS) K-12 instructional certificate is required to create an ePortfolio. The ePortfolio presents the student's knowledge and performance in the competencies required by the ITS guidelines.

LTMS 698 - Learning Technologies Internship

(1 to 6 semester hours)
Prerequisites: GRAD 695 or permission of advisor
Description: The student conducts learning technology-related activities at an organization to apply concepts and skills previously explored throughout the program. This experiential course also provides an opportunity to demonstrate and further develop the eight University competencies, i.e., critical thinking, communication, teamwork and collaboration, entrepreneurship, information literacy, ethical decision making, global awareness, and civic engagement.

LTMS 699 - Applied Project in LTMS

(3 semester hours)
Prerequisites: GRAD 695 or permission of advisor
Description: This course allows the student to pursue an area of interest that is within the broad scope of learning technologies. A faculty member supervises this study.

MGMT 510 - Business Strategy and Management Principles

(3 semester hours)
Prerequisites: None
Description: This course introduces the basic concepts of business strategy and management principles of planning, organizing, staffing, developing, and monitoring/control. The context is global markets and their impact on business strategies and managerial processes. The course explores the best practices in global strategic management, organizational design, human resource processes, and organizational behavior.

MGMT 511 - Digital and Global Enterprises

(3 semester hours)
Prerequisites: MGMT 510
Description: Modern enterprises are globally dispersed organizations where nearly all significant business processes and relationships with customers, suppliers, and employees are digitally-enabled and key corporate assets are managed through digital means. Such organizations merge the concepts traditionally discussed in ecommerce, ebusiness and egovernment. This course introduces the organizational and operational aspects of such organizations and highlights the role of managing such organizations. Topics include organizational structure and design, learning and agile organizations, and operational concerns such as management of supply chains and B2B trade at a global level.

MGMT 512 - Marketing Principles and Applications

(3 semester hours)
Prerequisites: MGMT 510
Description: This course introduces the student to the most recent and relevant thinking in marketing in the competitive global marketplace. The student is provided with analytical tools to understand and synthesize the most current applications of theories and concepts in marketing. The student is shown how to design strategic planning for competitive advantage in the marketplace and is encouraged to explore the essence of marketing environment and the global vision for business marketing.

MGMT 513 - Accounting Principles and Applications

(3 semester hours)
Prerequisites: MGMT 510
Description: This course explores the basic financial and managerial accounting competencies needed to manage a business or product line. The accounting concepts are introduced with a discussion of how general purpose financial statements reflect the business corporations' performance and position for readers external to management.

MGMT 520 - Professional Communication

(3 semester hours)
Prerequisites: None
Description: This course provides training in business writing, interpersonal communication and oral communication to prepare the student to be a more effective professional communicator. The student works on projects in the classroom that offer practical applications of concepts covered in the textbook, including case study examples of poorly executed business communication that the student revises and improves. The student also writes a proposal and a report and prepares a plan to manage a project team kickoff meeting.

MGMT 531 - Business Entrepreneurship Principles

(3 semester hours)
Prerequisites: MGMT 510
Description: This course is designed for the student and working professional with interest in owning, or participating

in, a successful business startup. The course focuses on the principles that are essential to forming a successful startup company, and the role of innovation in entrepreneurship.

MGMT 532 - Business Entrepreneurship Management

(3 semester hours)
Prerequisites: MGMT 531
Description: This course focuses on the management and planning processes needed for sustained growth of a startup company. Specifically, the course goes beyond the initial idea formulation stages and provides hands-on experience in developing a business plan for a startup. Emphasis is placed on innovation and the management of opportunities rather than to concentrate on the efficient management of ongoing operations. The course is organized around the following themes: management systems for innovative companies, short- and long-range planning in owner-managed businesses, measuring economic performance and obtaining information for management decision making, legal and human resource issues, and entrepreneurship and managing growing companies.

MGMT 533 - Business and Entrepreneurial Financing

(3 semester hours)
Prerequisites: MGMT 531
Description: This course introduces the student to the fundamentals of business financing with emphasis on financing for entrepreneurship. The course covers topics such as financial theory, risk assessment, and financial reporting systems in modern business settings. Special attention is paid to financing the startups with different options from venture capitals, angels and banks.

MGMT 560 - Organizational Leadership

(3 semester hours)
Prerequisites: None
Description: Successful project managers are adept at leading. Leadership, however, is a complex undertaking that requires knowledge and understanding of a number of competencies. This course builds these competencies. Focusing on organizational leadership, the course explores and develops skills and knowledge needed to lead organizational transformation and change, negotiate conflict resolution, build relationships and human capital, and instill business ethics and professional codes of conduct.

MGMT 580 - Special Topics in Management

(3 semester hours)
Prerequisites: None
Description: This course explores a topic of current interest in the field of management. Due to the nature of evolving topics, this course may not be eligible for repeat.

MGMT 721 - Management Sciences I

(3 semester hours)
Prerequisites: Completion of all 500-level Breadth courses and ISEM 706, or permission of instructor
Description: This course is concerned with the use of quantitative approaches to formulate, analyze, and solve business, management, and social problems. Advanced management science combines operations research and management systems to model complex management problems to discover and apply optimal solutions. The student is expected to investigate complex managerial and societal problems using scientific methodologies. Topics include, but are not limited to, Management Science Research, Linear Programming, Modeling with Spreadsheets, Inventory Management, Network models and Forecasting techniques.

MGMT 722 - Management Sciences II

(3 semester hours)
Prerequisites: MGMT 721
Description: A continuation of Management Science I, combining operations research and management systems to model complex management problems to discover and apply optimal solutions. Basic deterministic models and methods are described in MGMT 721. The main focus of this course is on advanced deterministic and stochastic models in Operations Research. Topics include, but are not limited to, Stochastic processes, Markov chains, Queuing models, Non-linear optimization, Dynamic programming, and game theory.

MGMT 731 - Innovation and Entrepreneurship

(3 semester hours)
Prerequisites: Admission to ISEM Doctoral Program
Description: In this course, the models for successfully organizing technologically driven innovations, in entrepreneurial and established firms, are studied, and critiqued. The student learns to develop innovative-based strategies, which will cause entrepreneurial organizations to earn sustained competitive advantage. The student also discovers how to identify, build, and commercialize technological innovations. This course emphasizes the need for continuity in the building and commercialization of valuable innovations. It draws heavily from recent literature and models on entrepreneurial innovation and expects the student, not only to critique these existing literature and models, but to design original technology-driven innovations that could aid organizations gain and sustain competitive advantage. The course is divided into 4 Modules, which takes the student from the formulation of innovative ideas to the building of innovative entrepreneurial firms. These modules will systematically guide the student to conduct a focused literature review on some advanced aspect of the studied material and produce a research paper.

MATH 510 - Applied Statistical Methods

(3 semester hours)
Prerequisites: None
Description: This is an applied statistics course with probability theory being presented but applicable statistics is emphasized. The course covers the statistical methods and models that practitioners require for use in their professions and is an applied course in regression, analysis of variance, and linear models which includes experience with the SAS statistical software package. Topics include descriptive statistics/data summaries, inference in simple and multiple linear regression, residual analysis, estimation and testing of hypothesis, transformations, polynomial regressions, model building with real data, nonlinear regression and linear models. This course is not mathematically advanced but covers a large volume of material.

NGEN 520 - Foundations of Blockchain

(3 semester hours)
Prerequisites: None
Description: Blockchain technology is recognized worldwide as a serious disruptive force in both the history of money and in ledger technology. In a short period of time, hundreds of thousands of blockchains have emerged to cater to multiple problems whether they are monetary, business, economic, social, or even political problems. It brings forth serious issues of governance as well as the need to reorganize multiple enterprises like state entities, corporations, banks, court systems, etc. This course introduces the student to the significance of this paradigm shift with broad coverage of important changes and the agents of the change. It explores origins of Bitcoin, technical details of underlying blockchain technology, elements of cryptography, supportive technologies, predominant concepts of distributed computing, and emerging layering of internet protocols and their role in new wealth systems.

NGEN 525 - Cryptocurrency and Regulation

(3 semester hours)
Prerequisites: None
Description: After the emergence of Bitcoin, thousands of cryptocurrencies have surfaced with a vast supportive infrastructure for exchange of this value. This has resulted in diverse responses from governments and other regulating bodies. This course contains a comprehensive history of crypto assets and infrastructure, including exchanges, wallets, tokens, central bank-issued digital currencies, and the state of regulations. This course gives the student an introduction of blockchain assets, as well as explain how government jurisdictions are responding to this unique disruption. Cross-listed with ISEM 576

NGEN 534 - Ethereum Blockchain

(3 semester hours)
Prerequisites: NGEN 520 or ISEM 574 or permission of instructor.
Description: Ethereum is an exciting alternative to Bitcoin that provides support for Smart Contracts and Decentralized Applications (DApps) that are not possible to create on Bitcoin. This course offers not only a core developer experience for the Ethereum platform with Web3 and the Solidity programming language, but also offers a comprehensive survey of how the Ethereum platforms have contributed to a completely new offering of DApps. Topics that are covered include Metamask wallet, Remix integrated development environment, transactions, keys and addresses, decentralized consensus, oracles, tokens, smart contract security, and other Ethereum technologies. Cross-listed with ISEM 575.

NGEN 540 - Blockchain Scalability

(3 semester hours)
Prerequisites: NGEN 520 or ISEM 574 or permission of instructor
Description: Blockchain Technology has ushered in a range of blockchain technologies. Different blockchains have selected different trade-offs in terms of scalability, interoperability, and decentralization. This course begins with a basic introduction to growth challenges faced by blockchains and how that has evolved in the blockchain ecosystem. This course describes different approaches to scalability including the Lightning Network, channels, sidechains, plasma, rollups, appchains, and hyperchains. Cross-listed with ISEM 577

NGEN 545 - Industry Blockchain and Blockchain-as-a-Service

(3 semester hours)
Prerequisites: NGEN 520 and NGEN 525
Description: If enterprises are to adopt blockchain technologies, they need easy-to-implement blockchain platforms. Multiple players have emerged to offer such kind of solutions. Before any specific choice is made in this regard, it is critical to understand the sector and use-case specificity where blockchain needs to be applied. Since there are some standard responses to blockchain applications, this course offers a new way of approaching sectoral applications via building innovation templates. Once standard responses are stabilized, further nuances can be built over it. The major use cases to be covered are digital identity, supply chain, entertainment distribution, and provenance. This course not only offers a capacity building model for multiple industries, but also enables right platform choices in appropriate context.

NGEN 560 - Decentralized Finance

(3 semester hours)
Prerequisites: NGEN 520 or ISEM 574 or permission of instructor
Description: Blockchain is a fundamental disruption in the history of ledger technology, and it will deeply impact the future of all ledger-centric institutions such as central banks, commercial banks, companies and exchanges, as well as the currencies and assets that are transacted and traded inside them. This course covers Decentralized Finance (DeFi), the innovations and risks of DeFi, the range of existing DeFi applications and protocols, the extent to which DeFi is disrupting traditional finance, Fungible Tokens and Non-Fungible Tokens (NFTs), and Central Bank Digital Currencies (CBDCs). Cross-listed with ISEM 578

NGEN 585 - Principles of Software Architectural Patterns

(3 semester hours)
Prerequisites: A bachelor's degree in a related field with professional work experience in the field.
Description: This course serves as a catalog of commonly used design patterns, prominent and dominant software patterns, and their applications. The course is divided into three modules. First, Software Architecture Patterns covers the various architectural patterns of object-oriented, component-based, client server, and cloud architecture. The need for software patterns is described. The various architectural patterns are listed and explained in detail in order to convey the what, where, why and how of architectural patterns. Second, Enterprise Integration Patterns cover enterprise application integration patterns and how they are designed. Patterns of service-oriented architecture (SOA), event driven architecture (EDA), resource-oriented architecture (ROA), big data analysis architecture, and microservice architecture (MSA) will be carefully studied. Finally, Patterns for Containerized and Highly Reliable Applications covers advanced topics such as Docker containers, high-performance, and reliable application architectures. Key takeaways include understanding what architectures are, why they are used, and how and where architecture design and integration patterns are being leveraged to build bigger and better systems. Cross-listed with CISC 585.

NGEN 699 - Applied Project in Next Generation Technologies

(3 semester hours)
Prerequisites: GRAD 695 or permission of instructor
Description: This course allows the student to pursue an area of interest that is within the broad scope of Next Generation Disruptive Technologies. A faculty member supervises this study.

NURS 510 - Foundational Concepts for Master Prepared Nurses

(3 semester hours)
Prerequisites: Admission to the Master of Science in Nursing Program
Description: This course is the first course in the core curriculum for Master of Science in nursing. It provides an overview of the theory in advanced nursing to prepare the graduate with a broad knowledge and practice expertise that builds and expands upon their entry-level nursing practice. The student is expected to have a deeper understanding of the discipline of nursing to engage an advanced level of nursing practice and leadership in a variety of settings with the commitment to the lifelong learning philosophy.

NURS 515 - Quality and Safety

(3 semester hours)
Prerequisites: B or higher in NURS 510
Description: This course will introduce the student to the quality and process improvement methodologies within different healthcare settings. The student is expected to have a deeper understanding of nursing's role in quality and processes improvement. The student delves into the foundations of quality and process improvement practice through different standpoints, histories, frames of reference and interpretations of different views of the best practices.

NURS 520 - Healthcare Policy

(3 semester hours)
Prerequisites: Admission to the Master of Science in Nursing Program
Description: This course will explore contemporary issues in healthcare and how they are/or may be addressed through development, implementation, and evaluation of policy. Issues of economics, access, demand, and services are explored. The political issues underpinning public policy, decisions related to specific health services issues, as well as social determinants are examined. The societal and organizational contexts of the delivery of nursing services across various settings are explored with organizational, local, state, national, and global perspective.

NURS 540 - Advanced Research Methods and Evidenced-Based Practices

(3 semester hours)
Prerequisites: Admission to the Master of Science in Nursing Program
Description: This course builds upon the nurse's knowledge of research theories and methods and evidence-based practices. This course has some strong focus and data analytics and evaluation. Throughout readings, case studies and the application of data the student will have practical experience evaluating evidence-based solutions to improve the health outcomes of an individual or population.

NURS 550 - Advanced Pathophysiology/Pharmacology and Health Assessment

(3 semester hours)
Prerequisites: Admission to the Master of Science in Nursing Program
Description: This course builds upon the nurse's knowledge of anatomy and physiology, pathology in the disease process, pharmacology, and health assessment associated with the human body systems. This course is an integrated approach to health assessment.

NURS 605 - Foundations for the Clinical Nurse Leader I

(3 semester hours)
Prerequisites: Admission to the Master of Science in Nursing Program with the Clinical Nurse Leader Concentration
Description: This course provides a foundation for the implementation of the clinical nurse leader role. The student focuses on the role and its contribution to improve patient outcomes, ensure quality care and reduce health care cost. Concepts, theories, and issues related to nursing leadership and care environment management are investigated in depth. End of program competencies for the Clinical Nurse Leader role will be discussed.

NURS 610 - Foundations for Clinical Nurse Leader II

(3 semester hours)
Prerequisites: NURS 605
Description: The student applies elements of the CL curriculum with a select cohort of clients. This course facilitates the development of skills for advocacy and leadership in a microsystem to promote positive change in a healthcare delivery system while putting best practices into action. This course will include assignments that will fulfill 25 hours of non-preceptee hours that is a part of the total clinical hours needed to fulfill program requirements.

NURS 620 - Theoretical Foundation in Nursing Education

(3 semester hours)
Prerequisites: Completion of all MSN Core Courses and B or higher in NURS 510
Description: This course prepares the prospective nurse educator with the foundational principles necessary for teaching in various settings: classroom, clinical, and college laboratories, and health care agencies.

NURS 625 - Curriculum Development

(3 semester hours)
Prerequisites: Completion of all MSN Core Courses
Description: The purpose of this course is to offer the student applications in nursing curriculum design, including the development of a teaching/ learning philosophy, mission statement, programmatic goals, learning objectives, teaching plans, and individual courses.

NURS 630 - Epidemiology in Action: Tracking Health & Disease

(3 semester hours)
Prerequisites: Admission to the Master of Science in Nursing Program with the Clinical Nurse Leader Concentration
Description: The student will apply principles of epidemiology using public health and population health theories using data and other variables to determine the best possible clinical or population outcomes. This course includes assignments that will fulfill 25 hours of non-preceptee hours that is a part of the total hours needed to fulfill program requirements.

NURS 635 - Clinical Nurse Leader Evaluation of Health Outcomes

(3 semester hours)
Prerequisites: Admission to the Master of Science in Nursing Program with the Clinical Nurse Leader Concentration
Description: The student will use quality improvement and process evaluation techniques to track and evaluate health outcomes to ensure the best possible clinical or population outcomes. This course will include assignments that will fulfill 25 hours of non-preceptee hours that is a part of the total clinical hours needed to fulfill program requirements.

NURS 640 - Nursing Research and Evidence-Based Teaching Models

(3 semester hours)
Prerequisites: Admission to the Master of Science in Nursing Program
Description: This course provides an overview of teaching methods utilized in nursing education to support the student learning in clinical, didactic and online learning environments. The student examines various teaching/learning technologies, including simulation, and integrate these technologies with select teaching methods in the design of coursework to support learning.

NURS 645 - Assessment and Evaluation in Education

(3 semester hours)
Prerequisites: Completion of all MSN Core Courses
Description: This course explores the theories, principles, and practices that underpin the measurement and evaluation of educational settings and programs. This course includes content on approaches to giving feedback, test construction, and psychometric evaluation, development, and grading of written assignments, evaluation of clinical performance and self-evaluation for personal teaching effectiveness.

NURS 695 - Nursing Practicum I

(3 semester hours)
Prerequisites: Completion of all MSN Core Courses
Description: This experiential course synthesizes the key concepts of the program extending and applying these concepts to real-life practical problems or research investigation.

NURS 699 - Nursing Practicum II

(3 semester hours)
Prerequisites: NURS 695
Description: This course is a continuation of the experiential component. The course synthesizes the key concepts of the program extending and applying these concepts to real-life practical problems or research investigation.

PHSC 500 - Introduction to Population Health Management

(3 semester hours)
Prerequisites: None
Description: This course focuses on Population Health Management's principles as a pro-active and implementation-

based management approach to tackle health disparities, foster health equity, and improve population health outcomes. Population health management has emerged as an essential strategy for healthcare providers and payers. This course examines the challenges and opportunities to improve health within and across populations and value-driven accountable care models. This course will discuss the basic principles of Population Health Management that will help students (future) health care professionals or policymakers analyze current healthcare challenges and design possible solutions using the Population Health Management Approach.

PHSC 510 - Social Determinants of Health and Health Equity

(3 semester hours)
Prerequisites: None
Description: This course aims to introduce the social, economic, and political factors that impact individual and population health. The course presents the student with theories and evidence supporting multiple underlying determinants of health in populations. We will consider how health is affected by various determinants, and we will explore how social influences affect population health. Social influences include socioeconomic status, environment, policy (political influence), gender, race, sexual orientation, and neighborhood quality. We will examine structural factors that impact population health globally as well as in the United States. We apply the research and practice-oriented competencies and explore the potential for structural interventions and research to address health inequities and improve population health outcomes. The student will be encouraged to consider how they can make a difference in reducing or closing the health inequality gap that otherwise results from flawed understandings of patients' health ecologies.

PHSC 525 - Population Health Policy

(3 semester hours)
Prerequisites: None
Description: In this core course, the student will explore in-depth the development and implementation of public health and health-related policy to demonstrate measurable public health improvement. The student will be provided with a public health context of the private, non-profit, and governmental institutions that impact population health (both de facto and de jure) and health equity including policy, administration, education, and research. The student will conduct an international comparative study of public health systems, placing the U.S. system within an international context; will learn tools of writing white papers, policy briefs, and policy evaluation. Further, using an integrated team-based leadership model, the student would be able to carry out a `real world' analysis of a state or local health policy in partnership with state or local policymakers or other public health institutions. The student will conduct `vantage point' policy reviews (both de facto and de jure) to recognize and appreciate various stakeholder points of view, perceptions, and interests.

PHSC 540 - Population Health Research Informatics

(3 semester hours)
Prerequisites: None
Description: The healthcare informatics and data science field are a growing industry in the United States that is expected to grow more than $18.7 billion by 2020. Like many other fields, the healthcare industry increasingly relies on data to improve patient outcomes, lower costs, drive care coordination, foster quality clinical and preventive care, enhance healthcare delivery system performance, and optimize strategic business decisions. Whether you are gathering data or analyzing it to make recommendations, this course is designed to provide analytical literacy to understand, handle, organize, and visualize healthcare data, eventually informing and influencing research and policy decisions. It focuses on the most common types of data used in health care measurements and different ways to gather and analyze it. It enables the student to interact effectively with informatics specialists to define priority subject areas, evaluate data sources, data reporting, performance improvement, apply diverse data science methodologies, and effectively communicate data insights to diverse audiences.

PHSC 550 - Approaches to Population Health Innovations

(3 semester hours)
Prerequisites: None
Description: This course will introduce the student to the package of innovation perspectives and research methods employed within both design thinking and systems thinking approaches to population health innovation. The course will focus on the individual and collective experience of human health, via individual choice models and systems level structures and policies. Design thinking provides a flexible and disciplined innovation model that prioritizes public health needs at the patient level of engagement within health service offerings. Systems thinking in healthcare considers the ways large communities organize themselves to achieve collective health goals. When integrated together, both approaches to population health improvements leads the student to visualize population health as one holistic issue with multiple levels of focus and impact. The student will be able to fully synthesize population health issues at the micro and macro levels, to recommend a framework or model for improvements that can inform research and policy-related decision making and service innovations.

PHSC 598 - Practicum in Population Health

(3 semester hours)
Prerequisites: Enrolled in the Population Health Management Certificate
Description: The practicum is a population-level focused project conducted in a practice context. This course intends to engage the student in real-world population health activities, which enables them to demonstrate application of their population health concepts in the areas of their professional and research interests. This course requires that the student integrate and synthesize their population health knowledge and skills to develop and implement professional public health-related research, intervention, policy, or any practice activity. Each student is expected to complete a minimum of 140 hours of practicum and prior approval of the practicum from the program lead. The practicum will be supervised by the preceptor, who is qualified to evaluate the student's professional competence and supervise the student throughout the project. The preceptor needs to be engaged in population health practice-related activities, research, intervention, or policy directly. The preceptor can be within the university or outside the university (non-profits, community-based organizations, health departments, private corporations, other academic institutions, etc.) The program lead will be informed about the student's progress on pre-defined learning objectives. As part of the course, it requires the student to define their learning objectives following the practicum commencement competencies. It is recommended that the student links their practicum experiences to their career or professional goals. Upon completing this practicum, the student will be able to provide evidence of their applied population health knowledge and skills to potential employers.

PHAR 520 - Pharmacokinetics and Pharmacodynamics

(3 semester hours)
Prerequisites: A Bachelor of Science degree in Health Science
Description: This course introduces the student to the principal factors that can impact absorption, distribution, and elimination of drugs in the body. Specifically, mathematical approaches to characterizing pharmacokinetics (PK), the study of factors influencing drug concentrations in the body, and pharmacodynamics (PD), the study of the physiologic action of drugs in the body, are discussed with an emphasis on small molecule and protein therapeutics. The clinical and non-clinical applications of PK and PD will be discussed. The student will participate in simulations of real-world pharmacokinetic monitoring of various drugs used clinically to treat infections, control seizures, and suppress arrythmias.

PHAR 525 - Drug Transport

(3 semester hours)
Prerequisites: A Bachelor of Science degree in Life Science
Description: This course covers multiple aspects of drug transport, from simple diffusion to protein-mediated active transport of drugs and other xenobiotics. Specific transporters will be discussed in the context of clinical and pre-clinical effects on drug disposition. Distribution, substrates, and mechanisms of relevant drug transporters will be discussed, as well as how they can mediate potentially toxic effects of drugs.

PHAR 540 - Drug Metabolism

(3 semester hours)
Prerequisites: PHAR 520
Description: This course focuses on multiple aspects of drug metabolism. Specific content includes instruction on Phase 1 and Phase 2 drug metabolism. While the majority of the course will involve examining hepatic drug metabolism and extrahepatic metabolic pathways, drug metabolism in preclinical drug development will also be covered. This course will also expose the student to the role drug metabolism plays in potentially toxic drug effects and interactions.

PHAR 690 - Ethics and Trends in Pharmaceutical Science

(3 semester hours)
Prerequisites: To be taken in second year of Pharmaceutical Sciences program
Description: Ethics and Trends in Pharmaceutical Science presents current challenges, trends, and controversies concerning pharmaceutical science. Lectures are generally composed of presenting current (within the calendar year) articles from around the world that introduce a topic of interest. Such topics may include industry news, education trends, and regulatory controversies.

PHAR 699 - Applied Project in Pharmaceutical Sciences

(3 semester hours)
Prerequisites: GRAD 695 and permission of instructor
Description: This course allows the student to pursue an area of interest that is within the broad scope of Pharmaceutical Science. A faculty member will supervise this study.

PMGT 510 - Principles of Project Management

(3 semester hours)
Prerequisites: None
Description: This course introduces the student to project management knowledge areas and processes used by project managers to successfully deliver their project on time, within budget and to the expectations of project stakeholders. The student works on real-world examples, problems and case studies as individuals and in groups. An emphasis is placed on hard and soft skills, and the tools and techniques used by project managers to initiate, plan, execute, monitor/control, and successfully close projects in typical project environments associated with waterfall and agile methodologies.

PMGT 515 - Business and Requirements Analysis Fundamentals

(3 semester hours)
Prerequisites: None
Description: This course is designed to help the student prepare for a career in management, building on their technical and professional background and education. The field of business analysis is a fast-growing profession that offers a global certification. Business analysis is a key function on a project team that promotes understanding of what the customers want the project team to build for them; it is essential to project success. Through the use of real life project examples, the student gains expertise in planning, eliciting, writing, and managing customer requirements for IT and other types of projects. Cross-listed with ITPM 515.

PMGT 530 - Risk, Procurement and Contracts

(3 semester hours)
Prerequisites: PMGT 510

Description: Using real-life project examples and scenarios, the student will learn how to reduce negative risks exposure and understand opportunities uncertainty can provide in projects by using effective risk management practices such as risk planning, identification and control. The student will design a risk management plan and learn how to prepare a Risk Register. The student will also learn how to plan a procurement, understand different procurement methods and types of contracts, find a vendor, write a Request for Proposal and apply these concepts, tools and techniques to actual projects.

PMGT 540 - Planning and Executing Projects

(3 semester hours)
Prerequisites: PMGT 510
Description: This course will focus on the production of core project management deliverables necessary to successfully navigate today's complex projects with an introduction to current project management best practices. In this learning forum, the student will develop a project from the ground up. This is a comprehensive, semester-long project scoping, budgeting, scheduling and control course where practiced theory is the platform for learning. The course objective is to provide a practical hands-on learning experience that builds on the fundamentals established in PMGT 510-Principles of Project Management. The focus of this course is to demonstrate the applied project management artifacts to meet stakeholder expectations within the triple constraints of scope, schedule and cost while also exploring impacts to other key factors such as quality and risk.

PMGT 550 - Quality Management and Continuous Improvement

(3 semester hours)
Prerequisites: None
Description: The student will be introduced to how quality improvement techniques and quality management can be used to support organizational initiatives such as projects and operations. This includes quality planning, quality assurance and quality control. Statistical topics will also be discussed and linked to the Lean Six Sigma methodology to improve quality, productivity, and the competitive position. This course will also cover the relationship and overlap of project management and quality management using standards from the Project Management Institute and the International Standards Organization.

PMGT 563 - Emotional Intelligence for Project Managers

(3 semester hours)
Prerequisites: PMGT 510 and MGMT 560, or permission of the instructor
Description: This course will provide the student with a solid understanding of emotional intelligence and its principles and how it can be developed in each project leader. The student will also learn and apply a variety of strategies to develop their own emotional intelligence and to enhance their own self-awareness and self-management, along with developing relationship management skills to create successful project outcomes. Throughout the course, the student will also gain an understanding of how to use emotional intelligence to create a positive team environment and learn techniques to develop an emotionally intelligent organization. Through this course, the student will learn best practices in developing their self-motivation and gain an understanding of how change can be created using emotional intelligence. The EQ I 2.0 Emotional Intelligence Assessment is offered as a component of this course providing the student with a unique insight into their current level of emotional intelligence skills.

PMGT 570 - Agile Project Management with Scrum Methodology

(3 semester hours)
Prerequisites: None
Description: This course provides to the student the features, benefits, and practices of using Agile Project Management with Scrum Methodology and that this approach differs from traditional project management at the project level and enterprise level.

PMGT 572 - Agile Scrum Applied Projects

(3 semester hours)
Prerequisites: PMGT 570
Description: This course provides the student with hands on experiential learning using Agile Scrum as a member of a team. The team develops a vision statement and user stories for a real application. The team then implements the product that is specified using Agile Scrum Framework and all the standard Agile Scrum ceremonies such as Product Backlog, Sprints, Sprint Planning, Release Planning, Daily Standups, Sprint Review, and Sprint Retrospectives. Team members play the actual roles of Product Owner, ScrumMaster, Developers, Testers, etc. The course produces an actual working viable product that can be demonstrated to stakeholders. The team consists of a mix of graduate students from Project Management, ISEM, Computer Science, Analytics, and Learning Technologies.

PMGT 573 - Scaling Agile for the Enterprise

(3 semester hours)
Prerequisites: PMGT 570
Description: This course provides the student with a solid foundation of agile frameworks that have been scaled to the enterprise synchronizing alignment, collaboration, and delivery for large numbers of teams. One of the more popular enterprise agile frameworks called the Scaled Agile Framework (SAFe) will be studied and analyzed. This framework has been a proven framework for enterprises applying integrated principles and practices for Lean, Agile, Systems Thinking, and DevOps. In addition to SAFe, the course provides the student with an overview of other popular frameworks for scaling the enterprise, such as: The Disciplined Agile (DA), the Large-Scaled Scrum (LeSS), Nexus, Scrum@Scale, and Scrum of Scrum (SoS).

PMGT 574 - Lean Thinking

(3 semester hours)
Prerequisites: None
Description: This level course provides the student with key strategies in agile lean product development that will help the student streamline new product development processes that will decrease time-to-market, reduce waste, enhance product quality, and fully integrate new product designs into a lean production environment. This course uses principles rooted in the iconic Toyota Production system.

PMGT 576 - Agile Lean Transformational Leadership

(3 semester hours)
Prerequisites: PMGT 570 and PMGT 574
Description: This course provides the student with innovative practices that need to be followed in order to transform a company or organization from a traditional waterfall mindset to more of an Agile Lean mindset and culture. Agile Lean Change management (not the typical change management talked about in project management relative to scope, budget, etc.) is one method that is being used successfully in the industry to move organizations from a more traditional mindset to Agile Lean. A transformation to Agile Lean relies significantly on the leaders in the organizations to facilitate the change. In conjunction with this course, the student learns the responsibilities and techniques of the Agile Coach role, which has become a key role in the industry to facilitate change. The student will study the importance of leader standard work, visual management techniques, and methods for leading change. This course will also offer the student an opportunity to learn about and use various Lean tools and how to lead using these tools. The student will also gain insights into strategy deployment, leading Lean teams and sustaining a Lean transformation.

PMGT 580 - Project Management Offices

(3 semester hours)
Prerequisites: PMGT 540, PMGT 530

Description: This course provides the student an overview of the types of Project Management Office (PMO) structures, the key elements of each, and the key aspects of how to initiate and sustain a business-centered and value-driven PMO.

PMGT 610 - Project Management Practicum

(3 semester hours)
Prerequisites: PMGT 530, PMGT 540, and Permission of Program Lead
Description: Project Management Practicum is a second-year graduate course in applied learning with real-world community visibility and impact and is an exemplar of experiential learning at the graduate level. Students will work with local industry partners to assist in solving identified business problems using skills, techniques, and tools of the PM discipline. Opportunities may exist for follow-on internships and employment with industry partners. Students will have the opportunity to team with students from other HU graduate programs depending on the requirements of the identified business problem. This course is not eligible for repeat.

PMGT 695 - Applied Project Management I

(3 semester hours)
Prerequisites: MGMT 520, MGMT 560, PMGT 510, PMGT 530, PMGT 540, and PMGT 570
Description: The capstone course provides the student the experience to apply research methodologies and tools towards completion of a project management plan.

PMGT 697 - PMP/CAPM Exam Preparation

(0 semester hour)
Prerequisites: PMGT 510 and PMI membership
Description: This course exposes the student and the practicing project manager to the Project Management Body of Knowledge processes and standards, which prepares the student to take the PMP or CAPM certification exam. The student must take the PMP or CAPM exam and submit proof of a successful exam score. Upon completion of the six project management courses, the student has one year to take the PMP exam or take PMGT 697 and take the PMP exam.

PMGT 699 - Applied Project Management II

(3 semester hours)
Prerequisites: PMGT 695 or permission of instructor
Description: This course allows the student to pursue an area of interest that is within the broad scope of project management. A faculty member supervises this study.

QISC 530 - Foundations of Quantum Information Science

(3 semester hours)
Prerequisites: Graduate Standing or permission of instructor
Description: This course introduces the student to conversational aspects of the theories and concepts underlying quantum computers and how information can now be processed in ways previously impossible using traditional computing devices. The course acquaints the student with essential topics underlying the relevant physical, mathematical, and computer-sciences, necessary to navigate the technologies and problem-sets within quantum paradigm. Moreover, the technological, ideological, and social eco-systems engaged in quantum computing, past and present, are highlighted for the student. In this course the student will be introduced to practical aspects of quantum computing through limited hands-on experience with a quantum computer.

QISC 550 - Programming Quantum Computers

(3 semester hours)
Prerequisites: Graduate Standing and QISC 530
Description: This course reorients the student to a different way of solving real-world modeling problems by using a quantum computer. This is a hands-on programming course which features programming and problem solving on various quantum computer platforms, involving multiple quantum programming languages and techniques. A survey of the quantum hardware options is undertaken, and some areas of current research are introduced.

QISC 555 - Implementation Technologies in Quantum Devices

(3 semester hours)
Prerequisites: QISC 530
Description: This course introduces a wide range of scientific ideas, engineering techniques, and manufacturing technologies employed in harnessing quantum physics to create quantum devices; such as quantum clocks, computers, sensors, and the quantum internet. This is a topical-survey course that presents the terminology and basic principles underlying the theoretical and practical aspects of these devices. The student will be presented with the historical context and trajectory of important innovations and be brought up to date with the present state of these underlying technologies. At the conclusion of this course the student will be wholly conversant in the present challenges in the development of these devices, supported by a student-produced whitepaper, accompanied by the production of a video presentation.

QISC 565 - The Business of Quantum Technologies, Research and Policies

(3 semester hours)
Prerequisites: QISC 530
Description: This course surveys the historic and present-day business, governmental and academic landscape of quantum technologies and the associated ecosystem of the industry. An in-depth analysis of the quantum ecosystem (industrial, governmental, and academic) will be conducted leading to formation of individualistic projections of the industry, including a survey of opportunities and pitfalls for players in the ecosystem. Moreover, the student will be guided in developing a personalized document consisting of a meaningful business plan or research proposal that describes their projected entry into the quantum technology ecosystem; this proposal will be enhanced by the student creating a video presentation to accompany their document.

QISC 570 - Algorithms and Applications of Quantum Computing

(3 semester hours)
Prerequisites: Graduate Standing and QISC 550
Description: This course focuses the student on the application of quantum computing on solving and simulating various natural, real-world problems that are impossible to solve using traditional computers. Several complex, but quantum-solved, algorithms will be explored in their raw and in their quantum-program-coded forms, e.g, RSA encryption-breaking and the traveling-salesman problem. Throughout the course, the student will be applying their quantum computer programming skills to modeling and solving complex problems that they conceive, code, and debug.

QISC 575 - Emerging Topics in Quantum Information Science

(3 semester hours)
Prerequisites: Graduate Standing
Corequisites: QISC 530
Description: This course involves a deep-dive into a selection of technological topics according to the near-term urgencies in the advancement of the quantum information sciences. These topics will be explored in depth so the student cam recognize and understand the underlying issues, technological challenges and business opportunities brought about by the topic. In addition - under the professor's guidance - each student will self-select an additional

emerging topic for self-exploration, leading to a composition of a meaningful academic manuscript, whitepaper, or video presentation.

QISC 715 - Topics in Quantum Information Science

(3 semester hours)
Prerequisites: QISC 530 and ISEM 706, or permission of instructor
Description: This course focuses on four important applications of quantum computing and provides a foundation for the student to develop applied research in an area of their choosing. Students will be guided on practical and theoretical aspects of using a quantum computer for simulation, optimization, machine learning, and communications. The student will design, develop, and carry out original research in one of these areas.

Professional and Continuing Education

Professional and Continuing Education is responsible for all contracted training, non-credit certificates, and professional development offerings for employers and working professionals. The professional development offerings through Harrisburg University provide specific and advanced skills training and certificates within the University's mission of science and technology.

The University works with various organizations to develop a wide range of professional development solutions and programs that include:

- non-credit training events, series, and certificates;
- on-site and off-site credit-based offerings short of a degree such as workshops, institutes, clinics, concentrations, and specializations;
- on-site degree program; and
- academic program evaluation for employer training.

The University partners with various outside agencies including, but not limited to: corporations, government agencies, and school districts to develop customized solutions that contribute to professional development of the existing workforce. In particular, the University's professional development offerings serve:

- science, technology, and management professionals;
- educators and administrators; and
- senior staff responsible for innovation and decision-making.

All professional development programs follow the University's commitment to applied, experiential, and competency-based training and education. They focus on enhancing the ability of professionals to apply what they have learned immediately (and over the long term) to their jobs and careers.

Because the programs offered are demand-driven and change from year to year, up-to-date information on the current offerings is posted online at https://professionaled.harrisburgu.edu.

For more information on customized trainings or the calendar of upcoming professional development, contact ProfessionalEd@HarrisburgU.edu or call 717.901.5190.

University Administration

Harrisburg University of Science and Technology is a private, not-for-profit organization providing instruction, research, and service to the community. The University is governed by a Board of Trustees. The immediate regulation and direction of the academic, research, and service activities of the University are delegated by the Board of Trustees to the President and the faculty of the University. A listing of the administration, staff, and full-time and part-time faculty, their titles, and areas of instruction are available at the University website at https://harrisburgu.edu/faculty-and-staff-listing/.

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University Policies and Disclosures

These are some University policies that guide the conduct of the student, faculty, and staff. Additional details can be found in the Student Handbook, Faculty Handbook, and Employee Handbook.

Family Educational Rights Privacy Act (FERPA)

Introduction

The Family Educational Rights and Privacy Act, (FERPA), is a Federal law that ensures the privacy of a student's education records. It applies to all educational institutions, including colleges and universities, that receive federal funds under any program administered by the US Department of Education.

FERPA provides college students the general rights to:

- Control the disclosure of their education records to others except to the extent that FERPA authorizes disclosure without consent;
- Inspect and review their own education records; and
- The ability to review and amend errors in their education records.

Definitions

Eligible Student. An "eligible student" whose records are protected under FERPA is an individual 18 years of age or older or who is currently enrolled, or was enrolled, in a HU credit-bearing course at any age.

Education Records. Those records that are: (1) directly related to a student; and (2) maintained by HU. A record is directly related to a student if it contains personally identifiable information (PII) or enough tangential information that would allow a reasonable person within the HU community to identify the student. Examples of education records include but are not limited to:

- Financial aid and account information
- Transcripts and class schedules
- Housing agreements
- Disability accommodation records
- Disciplinary records/grade appeals
- Athletic records (if not deemed directory information).

Education records do not normally include (but can become FERPA protected if shared):

- Sole Possession Records. Records kept in the sole possession of the maker, are used only as a personal memory aid, and are not accessible to any other person except a temporary substitute for the maker of the record.
- Law Enforcement Records (including non-commissioned security officers).
- Employment Records. However, records of an employee who is employed by HU as a result of his or her status as a student ARE education records such as work-study students, graduate teaching assistants, and Resident Advisors (RAs).
- Alumni Records. Alumni records must be created or received by HU after an individual is no longer a student and are not directly related to the individual's attendance as a student unless the record falls within directory information. A student that opted out of sharing director information as of graduation remains in an opt out status unless it is updated.

- Treatment/Medical Records. Treatment/Medical records are specifically excluded as protected FERPA records under HIPAA. However, state confidentiality rules still apply to treatment professionals. Treatment records may become subject to FERPA if forwarded and used by others for the student's benefit such as documenting a disability for purposes of an academic accommodation. Treatment records are:
    - Made or maintained by a physician, psychiatrist, psychologist, or other recognized professional or paraprofessional acting in a professional capacity or assisting in a paraprofessional capacity;
    - Made, maintained, or used only in connection with treatment of the student; AND
    - Disclosed only to individuals providing the treatment.

School Official: Any person employed by HU in any administrative, supervisory, academic, research, or support Staff position (including security and health services Staff); any person or company with whom HU has contracted to provide a service to or on behalf of HU (such as an attorney, auditor, or collection agent); or any student serving on an official committee or assisting another school official in performing his or her tasks.

Legitimate Educational Interest. A School Official has a "legitimate educational interest" if the official needs to review an education record in order to fulfill the official's professional responsibilities as specified in their position description or as stated in a contractual agreement with a third party acting as an agent for HU.

Written consent: The election by a student of individuals, such as a parent or guardian, for the granting of access to the student's educational records. When granting consent, a student should specify the records that may be disclosed (or generically all of HU education records); the purpose for which they may be disclosed (for general information to assist me with his or her college experience) and the persons to whom they may be disclosed (parents, guardians, employer, etc.).

Student's Right to Review and Request Amendment of FERPA Records

All students have the right to view their education records. Students should submit in writing any request to review their education records to the Records and Registration office and identify which records are to be inspected. Within 45 days of receiving a request, Records and Registration will make arrangements for access and notify the student of the time and place where the records may be inspected. Records that are customarily open for student inspection will be accessible without written request. Records will not be copied or mailed.

If a student believes his or her records are inaccurate, he or she can submit a written request to HU's Records and Registration office to amend his or her education records that identifies the records to be amended and the basis for the alleged inaccuracies. Records and Registration will notify a student of its decision and, if the decision is negative, provide additional information regarding a student's right to appeal the decision. The FERPA process is not a substitute for a grade appeal only the recorded inaccuracy of a grade issued.

Disclosure without a Student's Consent

FERPA permits HU officials to disclose educational records and certain information to parents, or others, without consent of the student under certain circumstances:

- During a health or safety emergency to protect the student or other individuals;
- Any record to the parent when the student is a dependent for federal income tax purposes;
- Law enforcement unit records, including outside law enforcement authorities;
- Parental information when a student under 21 has violated any law or HU policy concerning the use or possession of alcohol or a controlled substance.

Directory Information

Directory information is contained in the educational records of a student that is not generally considered to be harmful or an invasion of privacy if disclosed. Consequently, it can normally be released without the need to obtain a student's consent.

HU defines directory information as:

- student's name
- both permanent and temporary addresses
- email address
- telephone number(s)
- class year, program of study
- enrollment status
- dates of attendance
- degree(s) and/or awards received
- photograph
- previous educational institution attended
- participation in officially recognized University activities
- eSports Statistics

Students wishing to have their directory information withheld can do so but must notify Records and Registration in writing or by the completion of a FERPA Disclosure of Directory Information form located on MyHU. A request to withhold directory information will preclude HU from providing a student's directory information to prospective employers, professional organizations, the media, and others with whom you may wish HU to share such information. However, this information will still be available to school officials with a legitimate education interest.

A student may opt out from sharing directory information at any time, but it will be effective prospectively only.

HU Privacy Notice

HU is committed to safeguarding the privacy of individuals who share personal data with it and in addition to the protections afforded under FERPA, HU has adopted a Privacy Notice that outlines HU's collection, use, and disclosure of information provided by prospective students, students, or third parties. A copy of HU's Privacy Notice is available on its webpage at: https://www.harrisburgu.edu/privacy/.

The Right to File a FERPA Complaint

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

Family Policy Compliance Office
U.S. Department of Education
400 Maryland Avenue, SW
Washington, DC 20202-4605

For additional information on FERPA: https://www2.ed.gov/policy/gen/reg/ferpa/index.html

Campus Crime and Security Disclosure

The Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act (Clery Act) requires the distribution of an annual security report and an annual fire safety report on or before October 1 to all current faculty, staff, and students and notice of its availability to prospective students, faculty, and staff. The annual security report includes statistics for the previous three years concerning reported crimes as identified by the Clery Act that occurred

on campus or property owned or controlled by the University, and on public property immediately adjacent to and accessible from the campus. The report also includes institutional policies concerning campus security, such as: crime prevention, the reporting of crimes, sexual harassment and assault, domestic violence, timely warnings, and other safety and security matters including public, private, and University resources that are available to the University community.

The University's current Clery Report is available on its website at https://harrisburgu.edu/disclosures/.

The Timothy J. Piazza Antihazing Disclosure

Harrisburg University does not tolerate hazing, whether occurring on or off campus. Students who engage in this behavior may face disciplinary action from HU, and may also face criminal charges under state law, including The Timothy J. Piazza Antihazing Law. This law requires Pennsylvania institutions to adopt a written policy against hazing and "adopt rules prohibiting students or other persons associated with an organization operating under the sanction of, or recognized as an organization by, a University from engaging in hazing or other identifiable offenses. It also requires the publishing of five years worth of hazing offenses on a bi-annual basis. The University's current antihazing policy and antihazing report is available on its website at https://harrisburgu.edu/disclosures/.

Equity in Athletics Disclosure Act (EADA)

The Equity in Athletics Disclosure Act Survey (EADA) was designed to make current and prospective students and current and prospective student athletes aware of an institution of higher education's commitment to providing equitable athletic opportunities for its men and women students. The EADA requires the disclosure of information about varsity teams and the financial resources and personnel that the school dedicates to those teams. The EADA requires any coeducational institution of higher education that participates in Title IV, the federal student aid program, and has an intercollegiate athletics program, to comply with the EADA by preparing an annual report, officially called The Report on Athletic Program Participation Rates and Financial Support Data; more commonly known as the EADA Report. The report is published annually for public inspection, no later than October 15th. As required by law, this report was electronically circulated to each HU student and is maintained at HU's publicly accessible webpage for current and prospective students at https://harrisburgu.edu/disclosures/.

Electronic Mail Communication Policy

Policy Statement - Unless otherwise prohibited by law, the University may send official communications to faculty, staff and students by e-mail to an account assigned by the University with the full expectation that such e-mails will be read by the recipient on a frequent and consistent basis and in a timely fashion.

Reason for Policy - The University must be able to communicate quickly and efficiently with faculty, staff, and enrolled students in order to conduct official University business. E-mail is an available and appropriate medium for such communication. Official communications may include policy announcements, registration and billing information, regulatory compliance disclosures, emergency notifications, and other information of a critical or timely nature. Faculty, staff and students may not opt out from receiving official University e-mail communications.

Assignment of E-mail Accounts - Students and employees are assigned an account in the HarrisbugU.edu domain. The account is designated as the "[FiLastname@HarrisburgU.edu]" or "[Student FiMiLastname]@My.HarrisburgU.edu" e-mail account. [The addressee protocol may vary slightly in the event of Initials/Name duplication]. The e-mail account is generated by Information Technology Services and may not be changed without University approval. University communications that are sent by e-mail will be sent to the University-supported e-mail account.

Responsibilities - Faculty, staff, and students are expected to review messages received through the University-supported e-mail account on a frequent and consistent basis. Communications may be time-critical. Individuals shall use the e-mail account for all University-related e-mail communications. Faculty shall use the University-supported account for e-mail communication with a student and, conversely, the student shall respond to faculty communications

or requests using the University-supported e-mail account, and no other email address will be used for official HU business.

Forwarding of E-mail - An individual who chooses to forward e-mail received on a Harrisburg University e-mail account to a different e-mail address risks loss of data integrity. The University is not responsible for e-mail, including attachments, forwarded to any e-mail address not supported by the University.

Third-Party, Web-Based [Cloud] Computer Records Policy

Policy Statement - It is the policy of Harrisburg University of Science and Technology that any and all user-generated content developed during the use of third-party, web-based (referred to as "cloud-based") technologies used in the classroom or coursework, which could include cloud-based instructional tools, cloud-based teaching and learning environments, and cloud-based server storage, is the property of the individual faculty, student, or staff who developed the content and that the University is not responsible, and shall be held harmless, for any theft, damage, manipulation or loss that may be incurred as a result of the failure by the third party to properly maintain or safeguard that content.

Reason for Policy - The University encourages and supports the use of new instructional tools and emerging technologies in open, digital teaching and learning environments. The use of web-based applications and cloud-based storage also bring new concerns about intellectual property and privacy. The Family Educational Rights and Privacy Act of 1974 (FERPA) (20 U.S.C. § 1232g; 34 CFR Part 99) is the federal law that protects the privacy of a student's education records. Generally, any work related to a course or program of study created by the individual is considered a part of the "student's education record." Accordingly, any work related to a course or program of study should not include personally identifiable information of the individual. Examples of "personally identifiable information" are: an individual's full name (if not common), Social Security number, date of birth, birthplace, face or fingerprints, credit card numbers, driver's license number, vehicle registration plate number, digital identity, or grades. Any of these data, when combined with other personal information, may identify an individual. Users of third-party, web-based technologies are strongly cautioned to avoid posting personally identifiable information in any computerized application.

A license agreement permits the University to provide access through its servers for the student to utilize the Microsoft OneDrive cloud-based computer server storage utility to store the student's ePortfolio during the period of enrollment in a program of study. The University requires that each degree-seeking undergraduate student develop an ePortfolio. An ePortfolio is defined as: *An organized, media-rich collection of documents, videos, and other exhibits that allows the student to demonstrate competence to a multitude of audiences.* Additionally, faculty, students, or staff are provided access to and use other web-based technologies and social media where user-generated content is stored.

The individual user of a third-party, web-based technology application, when establishing an account, is required to agree to the conditions of a Terms of Service or End-User Agreement, whereby the individual user accepts full responsibility for all content maintained in the application. Furthermore, the user agrees to a condition that, in no event will the software manufacturer be liable for any damages, whether direct, indirect, special, incidental, economic, compensatory, or consequential, arising out of the use of or inability to use the software or user documentation. Accordingly, the user is solely and exclusively responsible for any and all content.

Action Subsequent to Completion of a Program of Study or Termination of a Period of Employment - Any and all documents, videos, and other exhibits accumulated in an ePortfolio or other file, folder or collection by an individual who utilizes a third-party, cloud-based application or storage utility during a program of study or period of employment will no longer be accessible through the University's servers following the completion of the program of study or termination of a period of employment. Direct access to the materials held by the provider is conditional upon the Terms of Service or End-User Agreement accepted by the individual when the account was established.

Equal Opportunity

The University is committed to assuring equal opportunity to all persons and does not discriminate on the basis of race, creed, color, gender, age, religion, national origin, veteran or handicap status, or sexual orientation in its educational

programs, activities, admissions, or employment practices as dictated by University policy and as required by federal statutes (Title IX of the Educational Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, Titles VI and VII of the Civil Rights Act of 1964, the Americans with Disabilities Act of 1990 (ADA) and any other applicable anti-discrimination statutes, including those of the Commonwealth of Pennsylvania (Pennsylvania Human Relations Act of 1955 (PHRA) and the Pennsylvania Fair Educational Opportunities Act of 1961 (PFEOA)).

Student inquiries concerning compliance and information regarding Title IX, Title VI, Title VII, PFEOA, Section 504, campus accessibility, or ADA accommodations should contact the Office of Student Services.

Faculty and staff inquiries concerning compliance and information regarding Title IX, Title VII, PHRA, Section 504, campus accessibility, or ADA accommodations should contact the Office of Human Resources.

Title IX/Sexual Misconduct Policy

To ensure compliance with Title IX and other federal and state civil rights laws, HU has developed a Title IX/Sexual Misconduct Policy (harrisburgu.edu/wp-content/uploads/Sexual-Misconduct-Policy-August-2020.pdf) that prohibits discrimination and sexual misconduct on the basis of sex. Title IX requires HU to respond and take action to address sex-based discrimination and harassment complaints. This includes sexual misconduct complaints related to sexual harassment, sexual assault, domestic violence, dating violence and stalking. Therefore, upon receiving a complaint, HU will, without bias or conflict:

- Investigate what happened;
- Implement interim measures when appropriate during the investigation to prevent the potential of any further discrimination or harassment; and
- Take appropriate steps to resolve the matter in an effort to eliminate the discrimination/harassment, prevent its recurrence, and remedy its effects.

The procedures in HU's Title IX/Sexual Misconduct Policy (harrisburgu.edu/wp-content/uploads/Sexual-Misconduct-Policy-August-2020.pdf) outline HU's ability to receive, investigate, and resolve complaints of discrimination on the basis of sex. These procedures are designed to provide a supportive process for individuals who report discrimination and to ensure a fair process for individuals who are accused of discriminatory conduct. Internal investigation of allegations of discriminatory treatment or systemic discriminatory practices is intended to ensure that HU meets its commitment to an open and inclusive educational and employment environment. These procedures also describe HU efforts to conduct a timely, thorough, and fair investigation, as required by law.

HU's staff who participates in this process are trained (harrisburgu.edu/wp-content/uploads/Title-IX-Training-Reference-Materials.pdf) concerning the obligations of their roles as outlined within Title IX.

HU's policy also complies with the federal Violence Against Women Act Amendments to the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act (www.law.cornell.edu/uscode/text/20/1092), and the accompanying regulations (collectively referred to as VAWA).

Lastly, Title IX prohibits retaliation for asserting or otherwise participating in claims of sex discrimination. VAWA imposes additional duties on universities and colleges to investigate and respond to reports of sexual assault, stalking, dating or domestic violence, and to publish policies and procedures related to the way these reports are handled. HU has designated the Title IX Coordinator to coordinate HU's compliance with Title IX and VAWA, and to respond to reports of violations.

For information on the University's Title IX/Sexual Misconduct policy, or to file a report, please see the Title IX/Sexual Misconduct website at https://harrisburgu.edu/title-ix-sexual-misconduct-policy-reporting/.

Non-Discrimination Statute - Commonwealth of Pennsylvania

The Pennsylvania Fair Educational Opportunities Act of 1961 provides student access to benefits and services of the University and prohibits discrimination without regard to race, color, gender, religious creed, ancestry, national origin, sexual orientation, age, civil union, marital status, veteran status, handicap or disability, perceived handicap or disability, relationship or association with an individual with a handicap or disability, use of a guide or support animal, and/or handling or training of support or guide animals. This statutory obligation includes, but is not limited to, admissions, course offerings, transfer of credit, financial aid, scholarships, student employment, internships, educational and social programs, and student advisement and counseling.

Any complaint of an alleged act of discrimination can be filed by contacting the Pennsylvania Human Relations Commission (PHRC), 1101-1125 Front Street, 5th Floor, Harrisburg, PA 17110-2123 or by calling (717) 787-4410. Complaints must be filed within 180 days of the incident. Complaint forms can also be obtained at the PHRC's website: https://www.phrc.pa.gov/File-A-Complaint/ComplaintForms/Pages/default.aspx

Emergency Notification System

When HU becomes aware of criminal incidents that, in the judgment of HU's senior leadership, constitute an ongoing threat to the campus community, a Crime Alert will be issued to notify the HU community. Depending on the circumstances, a timely warning will be issued without delay and the information may be further disseminated by using one or a combination of the following: e-mail distribution, HU website, campus publications, and postings and/or activation of the externally hosted emergency notification Omnilert alert system to advise the community of the situation. HU withholds as confidential the names of victims. The same notification system will be used for other campus-wide emergencies/disasters such as fire, weather, or restricted access to buildings.

Members of HU's community may subscribe to receive emergency notifications text alerts regarding HU closures or emergency/disaster situations that may impact the HU community. You can subscribe to the system, "Omnilert," through the MyHU portal of HU's webpage. Enrollees will need to reregister on an annual basis. For additional information on any matters, you will be directed to, or you should go to HU's website or social media accounts. Subscribers are subject to text message costs assessed by their cell phone provider.

Peer-to-Peer ("P2P") File Sharing Information Technology Disclosure

Introduction

The Higher Education Act of 1965, as amended, under Title IV, Section 285(a)(1)(P) and Section 487(a)(29), effective August 14, 2008, requires the disclosure to users of information technology resources that Harrisburg University of Science and Technology has developed a plan to combat the unauthorized distribution of copyrighted material (including the use of technology-based deterrents) and will, to the extent practicable, offer alternatives to illegal downloading. The illegal distribution of copyrighted material is prohibited and may subject an individual to criminal or civil penalties.

The "Digital Millennium Copyright Act of 1998" (DMCA) states that copyrighted information is protected and that it is illegal to download, upload, or distribute that information in any fashion. The provisions of this law specify a process to deal with any claimed infringement.

Plans to "Effectively Combat" Unauthorized Distribution of Copyrighted Material

P2P traffic is identified via the Intrusion Prevention System (IPS) that is integrated within the University's Cisco ASA 5500 security appliance. In most cases, a client's connection to the network will be dropped when typical P2P traffic is sensed.

This intrusion system covers the known protocols that popular P2P clients - such as Torrents, Limewire, Bearshare, Kazaa, etc. - utilize to establish connections to potentially transfer files containing copyrighted material. Additionally, the ability for the student to pass files over the Wireless LAN between laptops has been shut down.

Compliance

Harrisburg University reserves the right to capture, preserve, and/or inspect any information transmitted through, stored on, or used on any IT resource.

Copyright Infringement and Penalties

Copyright infringement is the act of exercising, without permission or legal authority, one or more of the exclusive rights granted to the copyright owner under § 106 of the Copyright Act of 1976. These rights include, but are not limited to, the right to reproduce or distribute a copyrighted work. In the file-sharing context, downloading or uploading substantial parts of a copyrighted work without authority constitutes an infringement.

Penalties for copyright infringement include civil and criminal penalties. In general, anyone found liable for civil copyright infringement may be ordered to pay either actual damages or "statutory" damages affixed at not less than $750 and not more than $30,000 per work infringed. For "willful" infringement, a court may award up to $150,000 per work infringed. A court can, in its discretion, also assess costs and attorneys' fees, impound the infringing work, and grant temporary and permanent injunctions.

Willful copyright infringement can also result in criminal penalties, including imprisonment and fines.

For more information, please see the Web site of the U.S. Copyright Office at: www.copyright.gov, especially the Frequently Asked Questions at www.copyright.gov/help/faq.

Infringement of Digitally Copyrighted Material

The Digital Millennium Copyright Act of 1998 (DMCA) is federal law that criminalizes production and dissemination of technology, devices, or services intended to circumvent measures that control access to copyrighted works (commonly known as digital rights management or DRM). In addition, the DMCA heightens the penalties for copyright infringement on the Internet.

The designated agent to receive notification of a claimed infringement, in accordance with the provisions of the Digital Millennium Copyright Act, is:

Jacqueline Conforti Barnett
General Counsel
326 Market Street
Harrisburg, PA 17101
(717) 901-5100 ext. 1671
jbarnett@HarrisburgU.edu

If an infringement claim is submitted to the University by a complainant, appropriate action will be taken to identify the student, faculty, or staff member involved in the complaint.

Written notice to the involved individual by email requires the removal of the copyrighted files or documents from the computer containing the material within 72 hours of the formal notice. A reply confirmation is required when corrective action has been taken to remove the illegal files, documents, or other material.

Upon receipt of the material removal confirmation, the designated agent notifies the complainant of the University's resolution.

If an individual involved in the complaint fails to take the requested corrective action within 72 hours, access to the University's network will be deactivated. Reactivation to the network can only occur at such time that it is confirmed that corrective action was taken.

Copyright violations may also fall under other University policies and subject to discipline.

Campus ID Card Policy

The Campus ID Card serves as the University's student/faculty/staff ID card, provides access to campus buildings and events, and serves as the Library card.

While on campus, the Campus ID Card must be visible at all times and presented upon request to any faculty member, staff, security personnel, or contracted security personnel.

The Campus ID Card is the property of Harrisburg University of Science and Technology and all policies and procedures must be observed to retain the privilege of use. The card is not transferable and is only to be used by faculty, staff, a currently-registered student, and other authorized persons.

The Campus ID Card must be surrendered to the University upon deactivation. A fee may be assessed for any Campus ID Card that is not returned at the end of the expected period of use.

Campus Card Types

There are two versions of the Campus ID Card:

- Campus ID Card: card contains photo identification, student/employee ID number; and,
- Access-Only Campus ID Card: card without photo identification (typically for the short-term student or visitor).

Campus Card Usage

The primary purpose of the Campus ID Card is to provide easy identification of the cardholder and to permit access to permitted areas of the University campus. The Campus ID Card also serves as a library card. It is the responsibility of the cardholder to immediately report suspected lost or stolen cards to HU Security at HUSecurity@HarrisburgU.edu or by phone at 717-901-5180.

Campus Card Activation

The Campus ID Card is activated for faculty and staff following formal contractual employment or position appointment.

The Campus ID Card is activated for a student following admission to the University, payment of the required tuition deposit, and completion of course registration for the semester or other term.

Campus Card Deactivation

The Campus ID Card is deactivated for faculty and staff following formal cancellation of contractual employment or resignation or termination from the position appointment.

The Campus ID Card is deactivated for a student following a determination of withdrawal, dismissal, graduation or other completion of a scheduled period of enrollment.

Student Grievance Policy

AA situation, circumstance or incident may occur where a student concludes that they have incurred egregious harm as the direct result of an action caused by a member of the faculty or staff. A student in this circumstance may file a

formal grievance against a faculty or staff member of the University to seek administrative redress. Examples of adverse behaviors include but are not limited to: violation of confidentiality; offensive remarks as a deliberate insult individually, in the company of others, or in the classroom; r or, inappropriate relationships with the student which cause conflict of interest for either the student or faculty or staff.

A student who is compelled to submit a grievance must obtain a Student Grievance Form from Records and Registration. The form must be completed with an explanation of the facts of the allegation, and attach to it any and all documents, testimonies or petitions supporting the student's position as evidence. The completed grievance form should be submitted promptly to the Associate Vice President of Student Services.

A grievance cannot be filed on behalf of another person. Grievances may not be used to challenge academic or other policies or procedures of general applicability.

Additional information may be requested from the student while the grievance is being considered. The alleged faculty or staff person is interviewed and asked to sign an affidavit stating facts relative to the alleged incident. Following consultation with the Office of the Provost, a decision shall be rendered by the Associate Vice President of Student Services within five (5) business days of the grievance submission. The student then receives a determination letter.

If the student does not receive a satisfactory remedy relative to the grievance, the student may request a review by a Grievance Committee which consists of: the Associate Vice President of Student Services, who shall act as the Committee Chair, an administrator designated by the Provost, the Chair of the Faculty of the Whole, a member of the Office of Student Services, and a student representative that has no previous knowledge of the matter to be considered. The request for review by the Grievance Committee must be submitted in writing to the Associate Vice President of Student Services. Formal rules of evidence will not apply, and the panel may consider any evidence considered relevant and reliable. A student is permitted to have a representative to assist them during the proceeding; however, the representative may not be an attorney.

The student will be advised of the date and time of the Grievance Committee meeting so that he or she may participate. The Committee shall deliberate and reach a decision on the grievance in closed session and render its resolution regarding the grievance within ten (10) days of its meeting. The student will be notified promptly of the Committee's resolution in writing.

Acceptable Use of Information Technology Policy

Introduction

Harrisburg University offers comprehensive academic programs that emphasize science and technology. Access to information technology is essential to the pursuit and achievement of the University's instructional, research, administrative and service missions. As such, the use of information technology is a privilege and all members of the University community are expected to be responsible and ethical users of information technology. This policy applies to all technology acquired by or on behalf of Harrisburg University (wherever used) and all technology (however acquired) used on any Harrisburg University resources[1].

Purpose

This policy:

1. Promotes the responsible and ethical use of computing, information resources, and/or communication systems, collectively known as "information technology" but hereafter known as "IT," administered by the Office of Information Services (OIS).
2. Defines the rights, responsibilities, and standards of conduct for its faculty, administrators, staff, students, and other authorized users with regard to the use of IT.
3. Explains the appropriate procedures for enforcing any and all misuse of the University's IT resources and outlines appropriate disciplinary procedures for violating these rules.

[1]Computers, computer systems, networks, electronic communications systems, institutional or third-party cloud data storage media, facilities, peripherals, servers, routers, switches, equipment, software, files, or accounts.

Responsibilities

1. It is the responsibility of the University faculty, administrators, staff, or student workers to communicate this policy and its contents to any and all users of IT at, or in affiliation with, Harrisburg University. Not being aware of any part of this policy does not excuse the individual from being responsible for its contents.
2. The Harrisburg University OIS is responsible for the following:
    1. Maintaining user accountability requirements including user identification and authentication, account administration, and password integrity.
    2. Making every effort to protect the privacy of users and confidentiality of data[2].
    3. Ensuring fair access to IT.
    4. Developing and implementing security policies and standards.
3. All Harrisburg University IT users are responsible for the following:
    1. Acting in a responsible, ethical, and legal manner in the use of IT. As such, this use of IT implies consent with any and all applicable university policies and regulations.
    2. Using IT for authorized university business only. Excessive use of any IT resource for personal use is prohibited.
    3. Safeguarding data including personal information and passwords.
    4. Recognizing the limitations to privacy afforded by electronic services.
    5. Respecting other users and their expectation of privacy, confidentiality, and freedom of expression.
    6. Taking precautions to prevent the initial occurrence and/or spread of computer viruses. Therefore, network connected resources must utilize university-approved anti-virus software.
    7. Avoiding any unauthorized or illegal use of IT. This includes but is not limited to the transmission of abusive or threatening material, spam, or communications prohibited by state or federal laws.
    8. Using IT in compliance with applicable license and purchasing agreements. Each user is individually responsible for reading, understanding, and adhering to all licenses, notices, and agreements in connection with IT which he or she uses.

Compliance

1. Harrisburg University reserves the right to capture, preserve, and/or inspect any information transmitted through, stored on, or used on any IT resource without notice but especially when:
    1. There is reasonable cause a user has violated this policy.
    2. A user or an account appears to be engaged in unusual activity.
    3. It is necessary to protect the integrity, security, or functionality of IT resources.
    4. It is necessary to protect the University from liability.
    5. It is permitted or required by law.

Enforcement and Disciplinary Procedures

1. Any user who violates any part of this policy may be subject to the following:
    1. Suspension or revocation of the user's computer account and/or suspension or revocation of access to the University's IT resources.
    2. Disciplinary action as described in Harrisburg University's Student Handbook which may include suspension, dismissal, or expulsion from the University.
    3. Disciplinary procedures outlined in Harrisburg University's Faculty Handbook or any other documents outlining conduct for faculty, staff, administration, or student employees which may include termination of employment or other disciplinary action.
    4. Civil or criminal prosecution under federal and/or state law. Noncompliance with certain provisions of this policy may incur penalties under such laws which may include fines, orders of restitution, and imprisonment.

5. Re-instatement of computer privileges shall be examined on a case-by-case basis.

[2] While Harrisburg University recognizes the importance of (and makes every attempt to achieve) privacy, the University cannot promise privacy of information stored on, or sent through, university-owned systems or resources except for certain information pertaining to student records, research, or other proprietary or patentable materials.

Procedure to Update and/or Amend

Harrisburg University reserves the right to update and/or amend this document to reflect university policy changes and/or state or federal law.

Credit Card Policy

On July 15, 2004, the Commonwealth of Pennsylvania legislature enacted Act 82 of 2004 requiring universities to adopt a policy that regulates credit card marketing.

The Board of Trustees of the University adopted the following statement related to credit card solicitation on October 13, 2004:

"Harrisburg University prohibits the marketing of all forms of credit cards on university property and prohibiting credit card marketers from offering gifts to a student in exchange for completing a credit card application."

Americans with Disabilities Act of 1990

The Americans with Disabilities Act of 1990 (ADA) is a federal anti-discrimination statute which provides civil rights protection to individuals with disabilities in the areas of employment, public accommodations, State and local government services, and telecommunications. The ADA was designed to remove barriers which prevent qualified individuals with disabilities from enjoying the same opportunities that are available to persons without disabilities. Similar protections are provided by Section 504 of the Rehabilitation Act of 1973 (Section 504).

An applicant or student that requires an accommodation under the Americans with Disabilities Act (ADA) should submit any required documentation in person or by mailing to: Office of Disability Services, Harrisburg University of Science and Technology, 326 Market Street Harrisburg, PA 17101. All submitted documentation is confidential. See the Student Handbook for additional details regarding accommodations. If you have questions regarding the documentation policy and guidelines, email Student Services at ada@HarrisburgU.edu.

Addendum Updates

July Addendum

Graduate Tuition Rate:

The Board of Trustees of Harrisburg University of Science and Technology has approved the 2022-2023 graduate tuition rate of $830 per credit hour and a $500 program fee per semester. This is a 3.75 percent increase from the previous year and the first increase in graduate tuition in 10 years. This increase takes effect in August 2022.

Alternative Work Study/Fieldwork for Masters Degree Program:

Nontraditional CPT Track information was removed as this option is no longer available to students.

Nontraditional CPT Track

In certain circumstances, the DSO can authorize CPT prior to the program start date. To be eligible for this nontraditional CPT track, students must submit all required enrollment documents, the prior degree must be conferred if applicable, pay the semester tuition in full prior to the requested CPT start date, and must commit to remaining enrolled in a full course of study at Harrisburg University for a minimum of one full semester. Once you have engaged in the nontraditional CPT track, no refund can be given.

Admissions – International Students:

The below English proficiency requirement was updated:

- completed an undergraduate college degree program from a regionally accredited United States institution of higher education

The below English proficiency requirement was added:

- completed a full-time semester of graduate studies from a regionally accredited United States institution of higher education with a 3.0 or higher GPA

November Addendum

Satisfactory Academic Progress (SAP) for Financial Aid Recipients:

- Language updated to reflect statement that the Financial Aid SAP policy is as strict, or stricter, than the University SAP policy.
- Language updated to define student enrollment status and how it applies to SAP.
- Establishment of a policy on how incomplete grades are handled for SAP.

Federal Student Financial Aid Program Refund Calculation (R2T4):

- Language updated to demonstrate how University will manage funds when a financial aid recalculation results in a credit balance for the student.
- Establishment of a Post-Withdrawal Disbursement policy as it relates to federal financial aid.