2020-2021 Catalog Addendum

The following changes have been made to the 2020-2021 Academic Catalog regarding policies for Work Integrated Learning for the MBA and MSCS programs.

GENERAL INFORMATION ABOUT ADMISSIONS PROCESS

Foreign Transcript Evaluation: If required, Sofia will convert international GPAs before conduction the application evaluation. Applicants submitting transcripts from outside the United States may submit document-by-document GPA report equivalent to a bachelor's or master's degree in the U.S. A course-by-course GPA report will be required if you wish to transfer course-credits to Sofia University.

Official transcripts evaluation report must be done by an approved NACES agency (https://www.naces.org/members) and sent directly to the Office of the Registrar at registrar@sofia.edu or via post to:

Sofia University
Office of the Registrar
1069 East Meadow Cr.
Palo Alto, CA, 94303

English Proficiency Requirements

If your native language is not English but you have been instructed in the English language, you are not necessarily exempt from the Test of English as a Foreign Language (TOEFL), the Test of Written English (TWE) and the Oral Proficiency Interview (OPI) requirements.

If you meet at least one of the following requirements, you are exempt from TOEFL/TWE/OPI:

- Your native language is English.
- You have completed all secondary or postsecondary education in the United States, Canada or other another English-speaking country.
- Attended a U.S. educational institution for 1 year or more and earned a degree (not a certificate) with a 3.0 Cumulative Grade Point Average (CGPA) or higher.
- Attended an institution in a country where the native language is English for 1 year or more and earned a Degree (not a certificate) with a 3.0 cumulative GPA or higher.
- Attended an institution for a year or more and earned a degree (not a certificate) with a 3.0 cumulative GPA or higher where the official language of the institution was English for AL L coursework.
- Attended and successfully completed a Sofia approved Intensive English Program in the U.S. (Please contact the Office of Admissions for an approved list of English programs.
- Have taken a different English proficiency exam and achieved an equivalent score that meets Sofia's requirement. Please send your official valid English score to the Office of Admissions.

**Your English score cannot be older than 2 years at the time that is submitted to Sofia University*

The following countries are also exempt from TOEFL/TWE/OPI:

Antigua and Barbuda Anguilla Australia Barbados Bermuda Bahamas Belize Canada	Cayman Islands Dominica Ghana Great Britain (UK) Grenada Greenland Guyana Jamaica	Liberia New Zealand Saint Lucia South Africa St. Kitts Nevis Ang. Trinidad & Tobago Virgin Islands (British) Virgin Islands (US)

Bachelor's Degree:

Test	Minimum score required for full admission	How to submit your English score
Test of English as a Foreign Language (TOEFL) Internet Based Test (IBT)	61	Official English score sent by Test Center; Sofia University School Code:9770
TOEFL Computer Based Test (CBT)	173	Official English score sent by Test Center; Sofia University School Code:9770
TOEFL Paper Based Test (PBT)	500	Official English score sent by Test Center; Sofia University School Code:9770
International English Language Test System (IELTS)	6.0	Official English score sent by Test Center
Person Test of English Academic (PTE Academic)	50	Official English score sent by Test Center
International Test of English Proficiency (iTEP)	3.5	Official English score sent by Test Center
Cambridge English Exams	169	Official English score sent by Test Center
Duolingo English Test	85	Official English score sent by Test Center

Masters and Doctoral Degree:

Test	Minimum score required for full admission	How to submit your English score
Test of English as Foreign Language (TOEFL) Internet Based Test (IBT)	79	Official English score sent by Test Center; Sofia University School Code:9770
TOEFL Computer Based Test (CBT)	212	Official English score sent by Test Center; Sofia University School Code:9770
TOEFL Paper Based Test (PBT)	548	Official English score sent by Test Center; Sofia University School Code:9770
International English Language Test System (IELTS)	6.5	Official English score sent by Test Center
Person Test of English Academic (PTE Academic)	50	Official English score sent by Test Center
International Test of English Proficiency (iTEP)	4.0	Official English score sent by Test Center
Cambridge English Exams	176	Official English score sent by Test Center
Duolingo English Test	90	Official English score sent by Test Center

Master of Business Administration (MBA) with Work Integrated Learning (WIL)
(Hybrid, a combination of on ground and Online Courses)

MBA -WIL Program Overview

The Master of Business Administration (MBA) – Work Integrated Learning (WIL) based degree program provides students with comprehensive and well-integrated instruction in business fundamentals and decision making. It focuses on the development of deep self-knowledge and emotional intelligence that benefit managers across a range of business contexts. The program is designed to provide graduates with the knowledge, skills, and transpersonal perspective necessary to foster an organizational culture of value driven, analytics-based decision making in a competitive global strategic environment.

The MBA - WIL program balances the study of traditional business disciplines while focusing on the human dimensions of leadership and management. This approach is teamed with the strategic use of data to ensure a complete understanding of the business through a strategic lens that provides a transformative transpersonal vision of the organization. Core courses provide foundational knowledge of personality and motivation, operations, strategy, law, ethics, and leadership, to guide strategic actions leading to the enhancement of organizational performance and global sustainability. Specialized concentration courses provide in depth studies in the areas of analytics, leadership and technology innovation.

The MBA program has a pedagogically integrated Work Integrated Learning (WIL) component that allows all students to participate in a career-based work environment that directly maps to the MBA curricula. The WIL program allows students to directly apply their learning in a business environment while being mentored by an experienced faculty member. Within the WIL program, students will learn business, leadership, and communication skills and apply them to their MBA program while developing lessons learned documents, work application summaries, and technical products that reflect on their newly acquired workplace skills. Students will interact weekly with other WIL students to share experiences and provide peer guidance and advice. The work supervisor at the workplace will also be involved in the student's learning process through comprehensive feedback to assist the student. This communication will be facilitated through the faculty mentor.
Throughout the MBA -WIL program students apply, align, and balance three human strengths in organizational decision-making: rationality and logic (head); emotional intelligence (heart); and deep intuition (soul).

Overall, the MBA-WIL program strives to balance business centric principles with sound transpersonal ideals to prepare students to become transformative, innovative leaders in today's complex global business environment. As a result, students will be well equipped to adapt to changes in global technology to ensure a viable organizational future and sound financial foundation into the 21st century.

Program Goals

The program goals of the Master of Business Administration WIL Program are to ensure that students in the program will:

- Describe and apply theories and practices of transpersonal leadership to the successful management of a business, team, or project while in a WIL environment.

- Describe and employ effective transpersonal leadership approaches to teamwork in multidisciplinary and multicultural settings in a WIL environment.

- Apply, align, and balance three human strengths in organizational decision-making: rationality and logic (head); emotional intelligence (heart); and deep intuition (soul) in a WIL environment.

- Generate a holistic strategic use of data science and analytics to ensure a complete understanding of the business through a strategic lens that provides a transformative transpersonal vision of the organization in a WIL environment.

Program Learning Outcomes

The program learning outcomes of the Master of Business Administration WIL Program are to ensure that students in the program will:

- Analytically evaluate both quantitative and qualitative data and models to generate insights into trends and business opportunities to formulate ethical and innovative strategic directions and operational plans in myriad business domains.

- Strategically communicate using a variety of media and data analytics tools and visualizations to effectively communicate both internally and externally in a positive, innovative, and transformative manner.

- Apply the concepts, tools, practices, and strategies of core business disciplines to strategically analyze business issues and develop practical, analytics-based solutions in a business environment.

- Describe the contributions of geopolitics, economics, environmental awareness, social responsibility, sustainability, and cultural diversity to the contemporary global business environment, and develop ethical, analytics-based business strategies that address, integrate and balance these factors.

Plan of Study

The MBA-WIL centric curriculum is comprised of the following requirements:

1) **Mandatory Core Courses (9 Units):** There are 3 mandatory business administration foundational courses that must be completed. Each course is 3 units for a total of 9 mandatory core units. The Core consists of courses that aim to provide students with both the human relations and quantitative decision-making skills to lead business operations.
2) **Business Fundamentals Courses (24 Units):** Business Fundamentals courses provide exposure to the major functional areas of business. There are 8 business fundamentals required courses).
3) **Concentration Courses (9-12 Units):** There are 3 mandatory concentration classes in four different concentrations. Each course is 3 units for a total of 9 mandatory concentration credits. Students focus their studies by completing the Concentration of their choice.
4) **Work Integrated Learning Program (3 Units):** A student must complete the Work Integrated Learning Internship program. Students participating in a part-time/full-time internship course will receive one (1) internship credit unit each term and a total of three (3) internship academic credits will count towards their graduation requirement.
5) **Capstone Course (3 Units):** A student may complete a Capstone course to finish up their concentration.

A total of **48 units** are required in the above plan of study for graduation.

Mandatory Core Courses

- MBA2001 Personality and Motivation (3)
- MBA2002 Positive Psychology for Business (3)
- MBA2003 Decision Science 1 (3)

Business Fundamentals Courses

- MBA3001 Accounting (3)
- MBA3002 Finance (3)
- MBA3003 Economics (3)
- MBA3004 Data Analysis and Forecasting 1 (3)
- MBA3005 Operations (3)
- MBA3006 Business Law and Ethics (3)
- MBA3007 Strategy (3)
- MBA3008 Marketing 1 (3)

Concentration Courses

Business Analytics

In addition to the courses below, students may select additional courses from the Master of Science in Computer Science with approval of the Program Chair:

- MSCS2401 Data Science (3)
- MSCS3019 Data Visualization (3)
- MSCS3805 Statistical Analysis for Computer Science (3)

Leadership and Organizational Effectiveness

- MBA4301 Organizational Leadership & Management (3)
- MBA4401 Technology Innovation & Product Management (3)
- MBA4402 Program and Project Management (3)
- MBA4601 Marketing 2 (3)

Management of Technology and Innovation

- MBA4401 Technology Innovation & Product Management (3)
- MBA4601 – Marketing 2 (3)

Students select 3 units from the following courses:

- MBA4301 Organizational Leadership & Management (3)
- MBA4402 Program and Project Management (3)
- MBA4003 Full-Time Internship in Business (3)

General Concentration

- MBA4301 Organizational Leadership and Management (3)
- MBA4402 Program and Project Management (3)
- MBA4401 Technology Innovation & Product Management (3)
- MBA4601 Marketing 2 (3)

Work Integrated Learning Internship Course (3 Units)

- MBA 4003 Full Time Internship in Business
- MBA 4004 Part Time Internship in Business

Capstone Courses

- MBA4001 Capstone I
- MBA4002 Capstone II

Graduation Requirements

In order to graduate from Sofia University with the Master of Business Administration a student must:

1) Successfully complete all core, concentration and elective requirements
2) Successfully Complete the WIL Internship Course (3 units)
3) Successfully complete a minimum of 48 units
4) Pay all tuition and fees

MBA 4003 /4004-Full-Time Internship in Business and/or Part- Time Internship in Business (1 Unit)
This course presents a significant WIL experiential learning opportunity, typically with a company or community-based organization. The internship represents an educational strategy that links classroom learning coupled with the acquisition of knowledge in an applied work setting. The internship in a company is mapped to an experienced-based class that enables reflection and contemplation of business skills applied in the real-world environment. Classroom assignments enable critical reflection on the WIL internship experience and how it addresses specific MBA Program Learning Outcomes.

Master of Science in Computer Science (MSCS) with Work Integrated Learning (WIL)

(Hybrid, a combination of on ground and Online Courses)

MSCS Program Overview

The Master of Science in Computer Science (MSCS) STEM Program with Work Integrated Learning (WIL) at Sofia University is a rigorous and comprehensive graduate program that provides a sound foundation in core computer science principles as well as in cutting edge computer science specializations. It provides thorough coverage of the theory of computer science while providing relevant, practical, and applicable knowledge in a broad range of applied and advanced topics that are enhanced by integrating theory and practice in an innovative STEM based WIL environment. The program focuses on innovative, transpersonal, and transformative learning in the classroom and at the workplace to ensure that students are well prepared for the technical and managerial challenges of the rapidly evolving computing, engineering and scientific industries as well as the challenges of future academic and research-based endeavors.

The MSCS STEM program includes a science, technology, engineering, and management focus (STEM). This facilitates a well-rounded industry centric approach to computer science to ensure that students are prepared to face the global challenges of the current technological environment. The program integrates solid foundations in the managerial, engineering, and scientific aspects of computer science, such as software, systems, and computer engineering, risk and safety management, software product management, as well as the core scientific, technological, and mathematical aspects of computer science and its integration with business, scientific, and engineering information systems as well as science, engineering, and business analytics programs.

The MSCS STEM program has a pedagogically integrated Work Integrated Learning (WIL) component that allows all students to participate in a career-based work environment that directly maps to the MSCS curricula. The WIL program allows students to directly apply their learning in a highly technical environment while being mentored by an experienced faculty member. Within the WIL program, students will learn technology skills and apply them to their MSCS program while developing lessons learned documents, work application summaries, and technical products that reflect on their newly acquired workplace skills. Students will interact weekly with other STEM WIL students to share experiences and provide peer guidance and advice. The work supervisor at the workplace will also be involved in the student's learning process through comprehensive feedback to assist the student. This communication will be facilitated through the faculty mentor.

Overall, the Work Integrated Learning based MSCS STEM program will provide students with valuable real time practical and adaptable work experience that will assist them in learning core computer science topics and provide a platform to help them reflect on their experiences to promote competence development and shared experiences with complete support by MSCS

faculty and student peers.

Program Goals

The goals of the Master of Science in Computer Science Program are to:

- Provide a sound, rigorous background in foundational and STEM based computer science theory and principles that are applied to the workplace in a supportive WIL environment.

- Provide a strong foundation in practical and applicable areas of applied computer science such as artificial intelligence, cyber security and software engineering that are relevant in the current STEM based industries and are adapted and applied in a WIL environment.

- Cultivate professional writing and research capabilities through WIL in the area of computer science to ensure sound professional managerial communications and knowledge expression in the STEM based industries that are applied directly in the workplace.

- Develop creative and innovative managerial thinking through a WIL environment in the area of computer science that fosters transformation and innovation in the science, technology, and engineering industries.

- Provide a set of rigorous concentrations that are mapped to WIL that foster a focused, detailed study of areas that are of high value and in demand in STEM based industries.

- Challenge technological thinking in a transformative, transpersonal manner to ensure that the ethical, legal, and social impacts of computational technology are responsibly considered when implementing and managing computing-based concepts, ideas, and products.

Program Learning Outcomes

The program learning outcomes of the Master of Science in Computer Science Program are to ensure that students in the program will:

- Integrate and apply to a workplace environment, sound computer science principles, logic, and mathematics in an innovative managerial manner in myriad science, technology, and engineering (STEM) industries.

- Integrate into the workplace computer science principles with sound research, writing, and analytic capabilities to foster professional managerial communications and knowledge expression in science, technology, and engineering (STEM) based industries.

- Integrate in a demanding technological workplace both inventive and innovative computer science skills and capabilities to become transpersonal, transformative managers and leaders in the science, technology, and engineering (STEM) industries.

- Integrate sound managerial judgment with computer science skills in the workplace to provide legal and ethical solutions to science, technology, engineering and management (STEM) problems with responsible, transpersonal, and transformative reflection on the social impacts of those solutions.

Plan of Study

The Master of Science in Computer Science STEM-based Work Integrated Learning (WIL) centric curriculum is comprised of the following requirements:

1) **Mandatory Core Courses (27 Units):** There are 9 mandatory computer science foundational courses that must be completed. Each course is 3 units for a total of 27 mandatory core units.
2) **Concentration Courses (12 Units):** A student is required to select one of two computer science concentrations and complete the 4 mandatory courses in that concentration. Each concentration course is 3 units for a total of 12 concentration course units.
3) **Work Integrated Learning Based Internship Program (3 Units):** A student must complete the Work Integrated Learning Internship program. Students participating in a part-time/full-time internship course will receive one (1) internship credit unit each term and a total of three (3) internship academic credits will count towards their graduation requirement.
4) **Elective Course (3 Units):** A student may take an elective course in any program including the computer science program, the psychology program or the business program. A student must take 3 units of electives. These can be a combination of 1, 2, and 3 credit courses.
4) **Capstone Course (3 Units):** A student must complete the capstone course in the last term of study. The capstone course is mandatory for all students and is 3 units.

A total of **48 units** are required in the above plan of study for graduation.

Mandatory Core Courses (27 Units)

The following are the program core courses:

- MSCS 2103 -Systems Programming
- MSCS 3801 -Discrete Mathematics for Computer Science
- MSCS 3802 -Automata, Computation, and Complexity
- MSCS 3803 -Algorithms in Python and R
- MSCS 2401 -Data Science
- MSCS 2202 -Machine Learning
- MSCS 2101 -Software Engineering
- MSCS 3804 -Cyber Security and Information Assurance
- MSCS 3019 -Data Visualization

Work Integrated Learning Based Internship Program (1 Unit)

- INTC 3000 Full Time Internship for Computer Science
- INTC 3001 Part Time Internship for Computer Science

Concentration Courses (12 Units)

Students will select one of the following concentrations. All courses in the concentration must be completed to earn that concentration. Substitution of courses is permitted with Program Chair approval.

1) **Artificial Intelligence**

- MSCS 3805 -Statistical Analysis for Computer Science
- MSCS 2201 -Artificial Intelligence
- MSCS 3008 -Introduction to Robotics
- MSCS 3806 -Advanced Topics in AI and Machine Learning

2) **Cyber Security and Information Assurance**

- MSCS 3920 -Cyber Security: Defense
- MSCS 3921 -Cyber Security: Forensics and Attack Analysis
- MSCS 2219 -Advanced Threat Analysis
- MSCS 3922 -Applied Cryptography

Elective Course (3 Units)

A total of 3 units of electives in the computer science, psychology, or business programs must be completed.

Capstone Course (3 Units)

The Capstone Course is mandatory and should be completed in the final or next to final term of study.

- MSCS 1022 -Technical Writing and Analysis for Computer Scientists: Capstone

Graduation Requirements

In order to graduate from Sofia University with the Master of Science in Computer Science, a student must:

1) Successfully complete all core, concentration and elective requirements
2) Successfully Complete the Capstone Course
3) Successfully complete a minimum of 48 units
4) Pay all tuition and fees

Program Course Descriptions

Core Course Descriptions:

MSCS 2103 -Systems Programming (3 Units)

This course covers the discipline of computer science, as it is founded at the most basic levels, at the fusion of electrical engineering, mathematics, and linguistics. The course covers the foundation of hardware and software logic, as manifested in both hardware and software constructs. It then maps software logic and structures to hardware logic and structures to form functional programs that are logically and structurally sound. Principles of number systems, Boolean and predicate logic, programming languages, language structure, logic gates, assembly principles, RAM, ROM, microprocessors, and computational mathematics are covered in depth. This course demonstrates how computer programs and hardware structures operate from the ground up and how the systems created affect managerial and technological decisions in the areas of science, technology and engineering.

MSCS 3802 -Automata, Computation, and Complexity (3 Units)

This course covers the theory of computation and application to complex and hard problems. Areas such as finite and push down automata, regular languages, regular expressions, context free languages, Turing machines, computability and complexity are studied in detail and applied to computational structures with real world applications. The science of language such as phrase and context free languages is covered in depth. The course includes a study in complexity theory and how it applies to hard computational problems. The course concludes with the application and management of automata, computation, and complexity in real world science, technology, and engineering scenarios and products.

MSCS 3803 -Algorithms in Python and R (3 Units)

This course provides a complete overview of the use and design of common algorithmic structures and their performance as implemented in many different programming languages. The course includes an in-depth presentation of basic and advanced algorithms and areas such as Big O notation. Formal algorithms are developed by students in both Python and R and then compared analytically to determine effectiveness and efficiency. The course discusses the computability and speed of algorithms and the trade-off analysis required to select the best algorithm for the complex computational problem at hand. The course concludes with the application and management of algorithms and algorithmic thinking in real world science, technology, and engineering scenarios and products.

MSCS 2401 -Data Science (3 Units)

This course covers the various elements of mathematics, statistics, data structures, databases, and computer science, and how they work together to provide the optimal analysis of data. The basic techniques of data science, algorithms for data mining, and basic statistical modeling are core competencies that will be studied. Data science leverages all available and relevant data to effectively provide a predictive model that can be applied to real world business, engineering, technical and scientific problems, and this course focuses on these areas extensively. The course concludes with an analysis of data science technologies and how data scientists access data, prepare data, and conduct viable substantive research across myriad domains, including the biological sciences, medical informatics, social sciences, engineering disciplines, and business organizations of all levels.

MSCS 2101 -Software Engineering (3 Units)

This course covers basic software engineering elements and processes. It focuses on techniques used throughout the software engineering process; the software lifecycle and modeling techniques for requirements specification and software design are emphasized. Both traditional and object-oriented approaches are addressed. This class covers software engineering concepts and ties them together strategically to help ensure that software is engineered with high quality in addition to being safe, secure, reliable, and resilient. Topics covered will include software safety, security, reliability, availability, and resilience; software risk management; software quality management through verification, validation, and testing; fault tolerance; concurrency; and advanced software modeling. The class also covers basic systems engineering concepts to ensure foundational understanding of the full software development process within a project as well as the managerial aspect of the software-based project. The class demonstrates the vital relationship between software engineering and scientific, technical, and other engineering disciplines.

MSCS 3804 -Cyber Security and Information Assurance (3 Units)

This course covers vital information assurance and computer security principles as applied to computer systems and organizational information systems. Information assurance principles such as availability, integrity, and confidentiality are applied strategically to ensure the integrity of data and information. The complex concepts of data privacy, data security, and the relationship of security to organizational computer systems are integral to this course. Many facets of computer security such as integrated circuit security, physical security, personnel security, systems security, security management, and operations security are discussed and related directly to information assurance principles. The concepts of risks, threats, and vulnerabilities as applied to computational systems are covered as well as the mitigation them through various forms of software and computer technologies in a defense in depth structure. The course also includes a survey of various laws and government initiatives to implement information assurance in the organization in a lawful manner. The course includes detailed analysis of cyber security as a management as well as a technological function. It also applies cyber security to myriad scientific, technological, and engineering disciplines as an integrated component of their information and intellectual property systems.

MSCS 3801 -Discrete Mathematics for Computer Science (3 Units)

This course covers applied discrete mathematics and forms a logical introduction to the critical mathematical side of computer science and software engineering. Discrete structures and discrete mathematics are the foundation of computer science. Areas such as set theory, number theory, combinatorics, logic, functions, and discrete constructs and structures are discussed in depth and applied to principles of computer science. Case studies such as the mathematics of the RSA algorithm are studied and applied to real world computer science applications in areas of science, technology, engineering, and management.

MSCS 2202 -Machine Learning (3 Units)

This course covers the primary areas of machine learning and applies them to real world computation scenarios. The goal of this class is to build computer models that can produce useful information whether they are predictions, associations, or classifications. This course covers the theoretical and practical algorithms, basic concepts and paradigms, key techniques, challenges, and tricks of machine learning. It also explores examples of how machine learning is used/applied today in the real world and demonstrates the construction and use of machine learning algorithms. This course discusses recent applications of machine learning, such as to robotic control, speech recognition, face recognition, data mining, autonomous navigation, bioinformatics, and text and web data processing. It also fuses machine learning with other areas of artificial intelligence and robotics and demonstrates the use and viability of machine learning models and techniques in myriad areas of science, technology, engineering and management.

MSCS 3019 -Data Visualization (3 Units)

This course introduces data visualization provides various means to communicate information and tell a story of quantitative data through graphic patterns. It exemplifies the concept that data

visualization makes big data more approachable and valuable and greatly impacts the decision-making process in fields such as science, technology, engineering, and management. This course introduces students to the core concepts and various techniques and tools for data visualization. The course reviews various analytical tools of statistics followed by the basic elements of visual business, engineering, and scientific intelligence. The techniques of good design consideration and data preparation for the best visuals are systematically discussed. The course also presents the elements of cognitive science theory and the principles of graphic/interaction design and then applies them to the visualization of information. The course includes myriad case studies in the science, technology, engineering, and management disciplines and industries.

Capstone Course Description

MSCS 1022 -Technical Writing and Analysis for Computer Scientists: Capstone (3 Units)
The purpose of the capstone project is to demonstrate a solid foundation at the graduate level of the field of computer science both in research and in application. The project allows the student to perform targeted research to develop an applied solution to a real-world situation or cutting-edge problem. The capstone also provides assessment of the student's ability to research, write, and communicate in the area of computer science as will be required in the computing and technology industry. The capstone focuses on a selected advanced computer science topic, then systematically engages students in that topic and its application across various science, technology, engineering, and management disciplines and industries. The capstone deliverable includes a detailed analysis of the topic and its current and future applications across the STEM areas.

Work Integrated Learning Based Internship Course Description

INTC 3000/3001 – Full Time Internship/Part-Time in Computer Science (1 Unit)

The Work Integrated Learning (WIL) based internship program is a significant experiential learning opportunity, typically with a company or community-based organization. The internship represents an integrated, practical, and applicable educational strategy that links classroom learning and student interest with the acquisition and direct application of knowledge in a workplace setting under the supervision of a faculty mentor. Through direct observation, reflection, and self-evaluation, students gain an understanding of the operational workplace environment and its myriad challenges and opportunities. Students will write critical reflections on their internship experience and will produce viable, innovative products that reflect on their learning in the degree program and in the workplace.

Concentration Course Descriptions

MSCS 2201 -Artificial Intelligence (3 Units)

This course covers the foundations of artificial intelligence as a holistic computer science discipline. The course explores the many aspects of how human intelligence is encoded in computer programs and mechanisms such as robots, self-learning programs, and advanced data analytics. This course introduces the foundation of simulating or creating intelligence from a computational point of view. It covers the techniques of reduction, reasoning, problem solving, search, knowledge representation, and machine learning and applies them strategically to various problems in science, technology, engineering, and management domains and industries. It also explores computational complexity and issues arising at the junction between biological and artificial intelligence and infuses these issues into tangible and applicable solutions in the STEM domains to ensure sound and ethical application of AI models, processes, and techniques.

MSCS 3008 -Introduction to Robotics (3 Units)

This course explores the computational processes and artificial intelligence basis of robotics. The integration of software and hardware systems is emphasized through proper computational paradigms such as algorithms, automata, search structures, and data manipulation in real-time reactive systems. Coverage of electronics and electronic interfaces will provide a solid foundation on which to base artificial intelligence structures. The use of sensors and motors, as controlled by software is covered in addition to the use of embedded and mechanical software driven systems. A special emphasis is placed on robot autonomy and learning through the precise use of computer algorithms and data structures. Robot sensing, analyzing, vision, and locomotion through computational structures will also be covered. The course integrates robotics theory and application into problem solving in myriad STEM domains and industries with the goal of sound, ethical solutions that are cost-effective and highly adaptive to the organization and its human elements.

MSCS 3806 -Advanced Topics in AI and Machine Learning (3 Units)

This course provides an advanced study of the latest research and applications in artificial intelligence, machine learning, robotics, and the data science used in their applications. It surveys complex and relevant issues and provides students with a holistic look into the advanced concepts of AI and machine learning, which fuse together many areas of science, technology, engineering, and management. Topics in the course include Natural Language Processing, Deep Learning, and Computer Vision. The course concludes with a comprehensive research paper that covers new and emerging areas of the fields of AI and machine learning and applies them to relevant STEM domains and industries. (Prerequisites: MSCS 2201, 2202)

MSCS 3805 -Statistical Analysis for Computer Science (3 Units)

This course covers the basics of statistical analysis and probability structures that are mandatory for the study of data science, as data science at its core is based on mathematics. Topics include exploratory data analysis, descriptive statistics, data and sampling distributions, statistical experiments and significance testing, regression and data prediction, Bayesian analysis, data classification, statistical machine learning, unsupervised learning, and probability structures. This course applies mathematical concepts to real-world data science problems and applications

relevant to STEM domains and industries.

MSCS 3920 -Cyber Security: Defense (3 Units)

This course covers the proactive and pre-emptive cyber defense of information system assets at the data level through the organizational level. The goal of proactive defense is to mitigate the cyber risk of the organization. As such, risk management and sound cyber based organizational management is comprehensively integrated into the course. The defense of critical infrastructure is studied and plans for preventing, protecting, and providing time sensitive responses to attacks or threats are covered in detail to insure the confidentiality, integrity, and availability of data and information throughout the organization. The complexity of attacks and blended threats is covered from a holistic security point of view to ensure that threats from advanced or multiple sources are effectively mitigated to protect sensitive information and to safeguard organizational assets. The course covers myriad complex case studies and applies lessons learned to various STEM disciplines and industries to ensure that these industries can pre-emptively disrupt complex and blended cyber-attacks for sound organizational information assurance.

MSCS 2219 -Advanced Threat Analysis (3 Units)

This course covers advanced techniques of complex, blended threat analysis to ensure that the organization and its information assets are safe and secure through methods that facilitate the confidentiality, integrity, and availability of data and information at all organizational levels. The course focuses on advanced machine learning and artificial intelligence techniques and software that pre-emptively assess and mitigate threats from local, national, and international sources. Extensive threat data modeling and analysis techniques are studied and applied to myriad science, technology, engineering, and management domains and industries. Special emphasis is placed on mitigating zero-day and large scale coordinated attacks on an organization's information infrastructure. The course explores and dissects case studies to demonstrate the best approaches and lessons learned from recent global cyber-attacks. The course concludes with the development of a software system that can sense and detect attack pre-emptions and protect the organization from those attacks, even if they are zero-day attacks based on sound threat analytics, visualizations, and models.

MSCS 3921 -Cyber Security: Forensics and Attack Analysis (3 Units)

This course covers the art and science of cyber security forensics, which is the application of investigation and analytical techniques to cyber systems to extract and preserve information that can inform cyber professionals on risk mitigation and that can legally be presented as evidence in a court of law. The course covers attack analysis in detail and provides sound investigative methods for collecting, analyzing, preserving, and interpreting cyber information and evidence. In addition to the technological aspects of cyber forensics, the course covers the legal aspects of cyber forensics including classifications of evidence, evidence preservation, evidence tampering, discovery procedures and protocols, and case presentation in court. The course concludes with

a comprehensive case study and the techniques and processes used to construct cyber forensic reports and evidence repositories for pending cyber-criminal cases. A major focus of the course is the application of forensics and attack analysis within various STEM based disciplines and organizations.

MSCS 3922 -Applied Cryptography (3 Units)

This course covers the basic and advanced concepts of cryptography and applies them to real world STEM applications with a special emphasis on cyber security and information assurance. It covers the mathematical and logical aspects of cryptographic systems and how these constructs apply to real-world organizational applications. The course also covers basic and advanced cryptographic protocols. Ciphers, encryption, and message integrity are studied expensively in mathematical theory and practical application. A comprehensive study of key systems and their management is a major part of the class. The course concludes with the construction of original cryptographic constructs that are applied to real world applications and tested for effectiveness and efficiency. A special emphasis on the use of cryptography in STEM disciplines and industries is a significant part of the application portion of the class.