DEPARTMENT OF INFORMATION SYSTEMS AND CYBER SECURITY

Mission Statement

The mission of the Department of Information Systems and Cyber Security is to offer graduate and undergraduate programs of high quality. The programs meet the needs of students preparing for professional careers in the fields of information systems or cyber security. This mission includes providing a broad-based education through the university's core curriculum, as well as education in current business and information systems or cyber security topics.

The department is responsive to the needs of employers and other constituents of its programs. The department is aware of rapid changes in technology. We incorporate these changes into the curriculum as is practical. The faculty assists in accomplishing the departmental mission through a planned integration of contributions in teaching, intellectual contributions, and service.

The Department of Information Systems and Cyber Security offers three undergraduate degree programs: one with a major in Information Systems and Technology, one with a major in Cyber Security (which is also offered 100 percent online), and a third major in Applied Cyber Analytics. For admission requirements for the online B.B.A. degree in Cyber Security, please visit https://online.utsa.edu/program/cyber-security/. The Department offers minors in Cyber Security, Digital Forensics, Information Systems, and Cloud and Data Center Management, which are open to all majors in the University. In addition, the Department offers a minor in Technology Management for non-business majors.

Additional Gateway Courses for Information Systems and Cyber Security

Students pursuing the B.B.A. degree in Information Systems and Technology or Cyber Security must successfully complete IS 2053 Programming I and IS 3413 Telecommunications and Networking with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete this course within two attempts, including dropping a course with a grade of "W" or by taking an equivalent course at another institution, will be required to change their major outside of Information Systems and Technology and Cyber Security.

- B.B.A. degree in Information Systems and Technology (p. 1)
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- B.S. degree in Applied Cyber Analytics (p. 7)

Bachelor of Business Administration Degree in Information Systems and Technology

The minimum number of semester credit hours for the Bachelor of Business Administration (B.B.A.) degree in Information Systems and Technology is 120, at least 39 of which must be at the upper-division level.

All candidates seeking this degree must fulfill the Core Curriculum requirements, the Common Body of Knowledge (CBK) requirements, and the degree requirements, which are listed below.

Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.B.A. degree in Information Systems and Technology must fulfill University Core Curriculum requirements in the same manner as other students.

MAT 1053 and MAT 1133 should be used to satisfy the core requirement in Mathematics (020) and the core requirement in the Component Area Option (090). ECO 2023 should be used to satisfy the core requirement in Social and Behavioral Sciences (080).

MAT 1053 , MAT 1133 , and ECO 2023 may be used to satisfy both Core Curriculum requirements and Common Body of Knowledge (CBK) requirements.

All degrees in the Carlos Alvarez College of Business require 120 hours. If students elect to take a course that satisfies both a Core and ACOB requirement, students may need to take an additional course to meet the 120 hours.

Core Curriculum Component Area Requirements (http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/degreerequirements/corecurriculumcomponentarearequirements/)

First Year Experience Requirement	3
Communication	6
Mathematics	3
Life and Physical Sciences	6
Language, Philosophy and Culture	3
Creative Arts	3
American History	6
Government-Political Science	6
Social and Behavioral Sciences	3
Component Area Option	3
Total Credit Hours	**42**

Common Body of Knowledge (CBK)

All students seeking a B.B.A. degree in the Carlos Alvarez College of Business must complete the following Common Body of Knowledge (CBK) courses in addition to the Core Curriculum.

ACC 2013	Principles of Accounting I	3
ACC 2033	Principles of Accounting II	3
ECO 2013	Introductory Macroeconomics	3
ECO 2023	Introductory Microeconomics (satisfies Social and Behavioral Sciences Core Curriculum requirement)	3
FIN 3013	Principles of Business Finance	3
GBA 2013	Legal, Social and Ethical Issues in Business	3
IS 1403	Business Information Systems Fluency	3
or IS 1413	Excel for Business Information Systems	
IS 3003	Principles of Information Systems for Management	3

MAT 1053	Mathematics for Business (satisfies Mathematics Core Curriculum requirement; this course is not required for Actuarial Science majors) [1]	3
MAT 1133	Calculus for Business (satisfies Mathematics or Component Area Option Core Curriculum requirement; Actuarial Science majors must take MAT 1213 in lieu of MAT 1133)	3
MGT 3003	Business Communication and Professional Development	3
MGT 3013	Introduction to Organization Theory, Behavior, and Management	3
MGT 4893	Management Strategy (taken in semester of graduation)	3
MKT 3013	Principles of Marketing	3
MS 1023	Business Statistics with Computer Applications I (Actuarial Science majors must take STA 3003 in lieu of MS 1023)	3
MS 3043	Business Statistics with Computer Applications II (Actuarial Science majors must take STA 3513 in lieu of MS 3043)	3
MS 3053	Management Science and Operations Technology	3
Note: Students majoring in Actuarial Science, Economics, Finance, Operations and Supply Chain Management and Business Analytics are strongly encouraged to select IS 1413 Excel for Business Information Systems. IS 1413 is required for Accounting majors.		

[1] Students may elect to substitute MAT 1093 Precalculus for MAT 1053 Mathematics for Business. Students electing to take MAT 1093 will need to meet prerequisites or achieve satisfactory performance on a placement examination. Visit UTSA Testing Services for more information regarding math placement exams.

In addition to the Core Curriculum requirements and the Carlos Alvarez College of Business Common Body of Knowledge (CBK), all candidates for the degree must complete the following degree requirements.

Gateway Courses

Students pursuing the B.B.A. degree in Information Systems and Technology must successfully complete the business math gateway course MAT 1053 (TCCN MATH 1324) or equivalent with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete this course within two attempts, including dropping the course with a grade of "W" or by taking an equivalent course at another institution, will be required to change their major outside of business. **Upon the second failed attempt students will be changed to undeclared and will not be eligible for a Bachelor of Business Administration (B.B.A) or a Bachelor of Arts in Economics degree.**

Code	Title	Credit Hours
MAT 1053	Mathematics for Business	3

Students pursuing the B.B.A. degree in Information Systems and Technology must successfully complete IS 2053 Programming I with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete this course within two attempts, including dropping the course with a grade of "W" or by taking an equivalent course at another institution, will be required to change their major outside of Information Systems and Technology and Cyber Security.

Code	Title	Credit Hours
IS 2053	Programming I	3

Students pursuing the B.B.A. degree in Information Systems and Technology must successfully complete IS 3413 Telecommunications and Networking with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete this course within two attempts, including dropping the course with a grade of "W" or by taking an equivalent course at another institution, will be required to change their major outside of Information Systems and Technology and Cyber Security.

Code	Title	Credit Hours
IS 3413	Telecommunications and Networking	3

Degree Requirements

Code	Title	Credit Hours
A. Major Requirements		**27**
IS 1003	Unlocking Cyber	
IS 2053	Programming I	
IS 2063	Programming II (or other department approved programming language course)	
IS 3063	Database Management for Information Systems	
IS 3073	Application Development	
IS 3413	Telecommunications and Networking	
IS 4053	Systems Analysis and Design	
IS 4063	Advanced Topics in Information Systems	
IS 4233	Cloud Computing	
B. Support Work		**60**
Business Common Body of Knowledge (51 SCH) (9 SCH Satisfy Core Curriculum Requirements)		
Option 1. Non-Track		
Students not selecting a track must complete 9 semester credit hours of upper-division IS courses which may include only ONE of the following two course choices:		
MOT 4023	Essentials of Technology Management	
or MOT 4143	Introduction to Project Management	
Option 2. Track		
IT Project Management Track		
Choose three courses from the list below:		
IS 4083	Agile Project Management	
MOT 4023	Essentials of Technology Management	
MOT 4143	Introduction to Project Management	
MOT 4153	Project Management Certification	
MOT 4203	Strategic Management of Technology and Innovation	
Information Technology Administration and Integration Track		
Choose three courses from the list below:		
IS 4013	Information Technology Administration I	

IS 4113	Information Technology Administration II	
IS 4143	Advanced Telecommunications and Networking	
IS 4223	Emerging Network Technologies	
MOT 4023	Essentials of Technology Management	
Analytics Track		
Choose three courses from the list below:		
IS 4023	Applied Big Data with Machine Learning	
IS 4043	Natural Language Processing	
IS 4183	Advanced Database Concepts and Applications	
MS 3003	Visualization in Business Analytics	
MS 3073	Business Intelligence and Analytics	
Research Track		
GBA 3013	Introduction to Academic Research	
GBA 4993	Honors Thesis (6 hours)	
Total Credit Hours		**87**

Course Sequence Guide for B.B.A. Degree in Information Systems and Technology

This course sequence guide is designed to assist students in completing their UTSA undergraduate business degree requirements. This is a term-by-term sample course guide. Students must satisfy other requirements in their catalog and meet with their academic advisor for an individualized degree plan. Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

Recommended Four-Year Academic Plan

First Year		
Fall		**Credit Hours**
AIS 1233	AIS: Business	3
MAT 1053	Mathematics for Business (core and CBK)	3
WRC 1013	Freshman Composition I (core)	3
IS 1003	Unlocking Cyber (major)	3
American History (core)		3
	Credit Hours	**15**
Spring		
MAT 1133	Calculus for Business (core and CBK) [1]	3
WRC 1023	Freshman Composition II (core)	3
IS 1403 or IS 1413	Business Information Systems Fluency (CBK) or Excel for Business Information Systems	3
IS 2053	Programming I (major)	3
American History (core)		3
	Credit Hours	**15**
Second Year		
Fall		
ACC 2013	Principles of Accounting I (CBK)	3
ECO 2013	Introductory Macroeconomics	3
IS 2063	Programming II (major)	3
MS 1023	Business Statistics with Computer Applications I (CBK)	3
Creative Arts (core)		3
	Credit Hours	**15**
Spring		
ACC 2033	Principles of Accounting II (CBK)	3
ECO 2023	Introductory Microeconomics	3
IS 3003	Principles of Information Systems for Management (CBK)	3
MS 3043	Business Statistics with Computer Applications II (CBK)	3
MGT 3003	Business Communication and Professional Development (CBK)	3
	Credit Hours	**15**
Third Year		
Fall		
IS 3063	Database Management for Information Systems (major)	3
IS 3413	Telecommunications and Networking (major)	3
MS 3053	Management Science and Operations Technology (CBK)	3
Language, Philosophy & Culture (core)		3
Life & Physical Sciences (core)		3
	Credit Hours	**15**
Spring		
IS 3073	Application Development (major)	3
FIN 3013	Principles of Business Finance (CBK)	3
IS 4233	Cloud Computing	3
MKT 3013	Principles of Marketing	3
Life & Physical Sciences (core)		3
	Credit Hours	**15**
Fourth Year		
Fall		
IS 4053	Systems Analysis and Design (major)	3
GBA 2013	Legal, Social and Ethical Issues in Business	3
MGT 3013	Introduction to Organization Theory, Behavior, and Management	3
Upper-division IS elective (3XXX or 4XXX level) (support work in major)		3
Government-Political Science (core)		3
	Credit Hours	**15**
Spring		
IS 4063	Advanced Topics in Information Systems (major)	3
MGT 4893	Management Strategy (CBK)	3
Upper-division IS elective (3XXX or 4XXX level) (support work in major)		3
Upper-division IS elective (3XXX or 4XXX level) (support work in major)		3

Government-Political Science (core)	3
Credit Hours	**15**
Total Credit Hours	**120**

[1] Carlos Alvarez College of Business students should take MAT 1053, MAT 1133, and ECO 2023 to satisfy both Core Curriculum and CBK requirements.

Bachelor of Business Administration Degree in Cyber Security

The minimum number of semester credit hours for the Bachelor of Business Administration (B.B.A.) degree in Cyber Security is 120, at least 39 of which must be at the upper-division level.

The B.B.A. degree in Cyber Security is also offered in a 100 percent online format. Students pursuing the 100 percent online format must fulfill all degree requirements in the same manner as residential students; however, the tracks are not offered in the 100 percent online format. Online students must select the non-track option (Option 1).

All candidates seeking this degree must fulfill the Core Curriculum requirements, the Common Body of Knowledge (CBK) requirements, and the degree requirements, which are listed below.

Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.B.A. degree in Cyber Security must fulfill University Core Curriculum requirements in the same manner as other students.

MAT 1053 and MAT 1133 should be used to satisfy the core requirement in Mathematics (020) and the core requirement in the Component Area Option (090). ECO 2023 should be used to satisfy the core requirement in Social and Behavioral Sciences (080).

MAT 1053, MAT 1133, and ECO 2023 may be used to satisfy both Core Curriculum requirements and Common Body of Knowledge (CBK) requirements.

All degrees in the Carlos Alvarez College of Business require 120 hours. If students elect to take a course that satisfies both a Core and ACOB requirement, students may need to take an additional course to meet the 120 hours.

Core Curriculum Component Area Requirements (http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/degreerequirements/corecurriculumcomponentarearequirements/)

First Year Experience Requirement	3
Communication	6
Mathematics	3
Life and Physical Sciences	6
Language, Philosophy and Culture	3
Creative Arts	3
American History	6
Government-Political Science	6
Social and Behavioral Sciences	3
Component Area Option	3
Total Credit Hours	**42**

Common Body of Knowledge (CBK)

All students seeking a B.B.A. degree in the Carlos Alvarez College of Business must complete the following Common Body of Knowledge (CBK) courses in addition to the Core Curriculum.

ACC 2013	Principles of Accounting I	3
ACC 2033	Principles of Accounting II	3
ECO 2013	Introductory Macroeconomics	3
ECO 2023	Introductory Microeconomics (satisfies Social and Behavioral Sciences Core Curriculum requirement)	3
FIN 3013	Principles of Business Finance	3
GBA 2013	Legal, Social and Ethical Issues in Business	3
IS 1403	Business Information Systems Fluency	3
or IS 1413	Excel for Business Information Systems	
IS 3003	Principles of Information Systems for Management	3
MAT 1053	Mathematics for Business (satisfies Mathematics Core Curriculum requirement; this course is not required for Actuarial Science majors) [1]	3
MAT 1133	Calculus for Business (satisfies Mathematics or Component Area Option Core Curriculum requirement; Actuarial Science majors must take MAT 1213 in lieu of MAT 1133)	3
MGT 3003	Business Communication and Professional Development	3
MGT 3013	Introduction to Organization Theory, Behavior, and Management	3
MGT 4893	Management Strategy (taken in semester of graduation)	3
MKT 3013	Principles of Marketing	3
MS 1023	Business Statistics with Computer Applications I (Actuarial Science majors must take STA 3003 in lieu of MS 1023)	3
MS 3043	Business Statistics with Computer Applications II (Actuarial Science majors must take STA 3513 in lieu of MS 3043)	3
MS 3053	Management Science and Operations Technology	3

Note: Students majoring in Actuarial Science, Economics, Finance, Operations and Supply Chain Management and Business Analytics are strongly encouraged to select IS 1413 Excel for Business Information Systems. IS 1413 is required for Accounting majors.

[1] Students may elect to substitute MAT 1093 Precalculus for MAT 1053 Mathematics for Business. Students electing to take MAT 1093 will need to meet prerequisites or achieve satisfactory performance on a placement examination. Visit UTSA Testing Services for more information regarding math placement exams.

In addition to the Core Curriculum requirements and the Carlos Alvarez College of Business Common Body of Knowledge (CBK), all candidates for the degree must complete the following degree requirements.

Gateway Courses

Students pursuing the B.B.A. degree in Cyber Security must successfully complete the business math gateway course MAT 1053 (TCCN MATH 1324) or equivalent with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete this course within two attempts, including dropping the course with a grade of "W" or by taking an equivalent course at another institution, will be required to change their major outside of business. **Upon the second failed attempt students will be changed to undeclared and will not be eligible for a Bachelor of Business Administration (B.B.A) or a Bachelor of Arts in Economics degree.**

Code	Title	Credit Hours
MAT 1053	Mathematics for Business	3

Students pursuing the B.B.A. degree in Cyber Security must successfully complete both IS 2053 Programming I and IS 3413 Telecommunications and Networking with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete these courses within two attempts, including dropping the course with a grade of "W" or by taking an equivalent course at another institution, will be required to change their major outside of Information Systems and Cyber Security.

Code	Title	Credit Hours
IS 2053	Programming I	3
IS 3413	Telecommunications and Networking	3

Degree Requirements

Code	Title	Credit Hours
A. Major Requirements		**27**
IS 1003	Unlocking Cyber	
IS 2053	Programming I	
IS 2063	Programming II (or IS 3073 or other department approved programming language course)	
IS 3033	Operating Systems and Security	
IS 3413	Telecommunications and Networking	
IS 3423	Network Security	
IS 3513	Information Assurance and Security	
IS 3523	Intrusion Detection and Incident Response	
IS 4893	Cyber Security Capstone	
B. Support Work		**60**
Business Common Body of Knowledge (51 SCH) (9 SCH Satisfy Core Curriculum Requirements)		
Option 1. Non-Track (students in the 100 percent online program must choose this option)		
Choose 3 courses from the list below:		
IS 3043	Secure Mobile App Development	
IS 3433	Cyber Crime Investigation Principles	
IS 3533	Cyber Law and Legal System	
IS 3833	Cyber Operations	
IS 4043	Natural Language Processing	
IS 4143	Advanced Telecommunications and Networking	
IS 4223	Emerging Network Technologies	
IS 4233	Cloud Computing	
IS 4463	Web Application Security	
IS 4473	Cyber Security Policy, Compliance, and Risk Assessment	
IS 4483	Digital Forensic Analysis I	
IS 4513	Industrial Control Systems Security	
IS 4523	Digital Forensic Analysis II	
IS 4533	Malware Analysis	
IS 4543	Cyber Attack and Defend I	
IS 4573	Engaged Cyber Defense	
IS 4643	Research Support for Federal Labs	
IS 4913	Independent Study	
IS 4943	Internship in Cyber Security	
IS 4963	Special Studies in Cyber Security	
IS 4973	Special Studies in Cloud	
IS 4083	Agile Project Management	
or MOT 4023	Essentials of Technology Management	
or MOT 4143	Introduction to Project Management	
IS 4553	Cyber Attack and Defend II	
IS 4563	Mobile Forensics	
Option 2. Track		
Cyber Operator Track (9 semester credit hours)		
Choose 3 courses from the list below:		
IS 3833	Cyber Operations	
IS 4483	Digital Forensic Analysis I	
IS 4513	Industrial Control Systems Security	
IS 4543	Cyber Attack and Defend I	
IS 4553	Cyber Attack and Defend II	
Cyber Policy and Strategy Planner Track (9 semester credit hours)		
Choose 3 courses from the list below:		
IS 3533	Cyber Law and Legal System	
IS 4223	Emerging Network Technologies	
IS 4473	Cyber Security Policy, Compliance, and Risk Assessment	
MOT 4023	Essentials of Technology Management	
Forensics Analyst Track (9 semester credit hours)		
Choose 3 courses from the list below:		
IS 3433	Cyber Crime Investigation Principles	
IS 4483	Digital Forensic Analysis I	
IS 4523	Digital Forensic Analysis II	
IS 4533	Malware Analysis	
Network Operations Specialist Track (9 semester credit hours)		
Choose 3 courses from the list below:		
IS 4143	Advanced Telecommunications and Networking	
IS 4223	Emerging Network Technologies	
IS 4233	Cloud Computing	
IS 4513	Industrial Control Systems Security	
Secure Software Analyst Track (9 semester credit hours)		
Choose 3 courses from the list below:		

IS 3043	Secure Mobile App Development	
IS 3073	Application Development	
IS 4083	Agile Project Management	
IS 4233	Cloud Computing	
IS 4463	Web Application Security	
IS 4533	Malware Analysis	
Research Track		
GBA 3013	Introduction to Academic Research	
GBA 4993	Honors Thesis (6 hours)	
Total Credit Hours		**87**

Course Sequence Guide for B.B.A. Degree in Cyber Security

This course sequence guide is designed to assist students in completing their UTSA undergraduate business degree requirements. This is a term-by-term sample course guide. Students must satisfy other requirements in their catalog and meet with their academic advisor for an individualized degree plan. Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

Recommended Four-Year Academic Plan

First Year		
Fall		**Credit Hours**
AIS 1233	AIS: Business	3
MAT 1053	Mathematics for Business (core and CBK)	3
WRC 1013	Freshman Composition I (core)	3
IS 1003	Unlocking Cyber (major)	3
American History (core)		3
	Credit Hours	**15**
Spring		
ECO 2023	Introductory Microeconomics (core and CBK) [1]	3
IS 1403 or IS 1413	Business Information Systems Fluency (CBK) or Excel for Business Information Systems	3
IS 2053	Programming I (major)	3
MAT 1133	Calculus for Business (core and CBK) [1]	3
WRC 1023	Freshman Composition II (core)	3
	Credit Hours	**15**
Second Year		
Fall		
ACC 2013	Principles of Accounting I (CBK)	3
ECO 2013	Introductory Macroeconomics (CBK)	3
American History (core)		3
IS 2063	Programming II (major)	3
Life & Physical Sciences (core)		3
	Credit Hours	**15**
Spring		
IS 3003	Principles of Information Systems for Management (CBK)	3
IS 3413	Telecommunications and Networking (major)	3
MGT 3003	Business Communication and Professional Development	3
MS 1023	Business Statistics with Computer Applications I (CBK)	3
Life & Physical Sciences (core)		3
	Credit Hours	**15**
Third Year		
Fall		
ACC 2033	Principles of Accounting II	3
IS 3033	Operating Systems and Security (major)	3
IS 3513	Information Assurance and Security (major)	3
MS 3043	Business Statistics with Computer Applications II (CBK)	3
Government-Political Science (core)		3
	Credit Hours	**15**
Spring		
IS 3423	Network Security (major)	3
IS 3523	Intrusion Detection and Incident Response (major)	3
FIN 3013	Principles of Business Finance (CBK)	3
MGT 3013	Introduction to Organization Theory, Behavior, and Management	3
Language, Philosophy & Culture (core)		3
	Credit Hours	**15**
Fourth Year		
Fall		
GBA 2013	Legal, Social and Ethical Issues in Business	3
MKT 3013	Principles of Marketing	3
Upper-division IS elective (support work in major) (must be approved Cyber Security content)		3
Upper-division IS elective (support work in major) (must be approved Cyber Security content)		3
Government-Political Science (core)		3
	Credit Hours	**15**
Spring		
MGT 4893	Management Strategy (CBK)	3
MS 3053	Management Science and Operations Technology	3
IS 4893	Cyber Security Capstone	3
Upper-division IS elective (support work in major) (must be approved Cyber Security content)		3
Creative Arts (core)		3
	Credit Hours	**15**
	Total Credit Hours	**120**

[1] Carlos Alvarez College of Business students should take MAT 1053, MAT 1133, and ECO 2023 to satisfy both Core Curriculum and CBK requirements.

Bachelor of Science Degree in Applied Cyber Analytics

The minimum number of semester credit hours for the Bachelor of Science degree in Applied Cyber Analytics is 120, at least 39 of which must be at the upper-division level.

All candidates seeking this degree must fulfill the Core Curriculum requirements and the degree requirements, which are listed below.

Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.S. degree in Applied Cyber Analytics must fulfill University Core Curriculum requirements in the same manner as other students.

EGR 1403 should be used to satisfy the Component Area Option (090). MAT 1093 should be used to satisfy the core requirement in Mathematics (020).

All degrees in the Carlos Alvarez College of Business require 120 hours. If students elect to take a course that satisfies both a Core and ACOB requirement, students may need to take an additional course to meet the 120 hours.

Core Curriculum Component Area Requirements (http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/degreerequirements/corecurriculumcomponentarearequirements/)	
First Year Experience Requirement	3
Communication	6
Mathematics	3
Life and Physical Sciences	6
Language, Philosophy and Culture	3
Creative Arts	3
American History	6
Government-Political Science	6
Social and Behavioral Sciences	3
Component Area Option	3
Total Credit Hours	**42**

Degree Requirements

Code	Title	Credit Hours
A. Major Requirements		**75**
1. Mathematics and technical writing		
EGR 1403	Technical Communication (satisfies Component Area Option Core Curriculum requirement) [1]	
MAT 1093	Precalculus (satisfies Mathematics Core Curriculum requirement) [1]	
MAT 1213	Calculus I	
MAT 1223	Calculus II	
MAT 2253	Applied Linear Algebra	
2. Required quantitative courses		
IS 3063	Database Management for Information Systems	
IS 4023	Applied Big Data with Machine Learning	
IS 4043	Natural Language Processing	
MS 3003	Visualization in Business Analytics	
MS 3073	Business Intelligence and Analytics	
MS 3313	Statistical Modeling for Business Analytics	
STA 3003	Statistical Methods and Applications	
STA 4233	Introduction to Programming and Data Management in R	
3. Required cyber security courses		
IS 1003	Unlocking Cyber	
IS 2053	Programming I	
IS 3033	Operating Systems and Security	
IS 3413	Telecommunications and Networking	
IS 3423	Network Security	
IS 3513	Information Assurance and Security	
IS 3523	Intrusion Detection and Incident Response	
IS 3833	Cyber Operations	
IS 4233	Cloud Computing	
4. Required applied cyber analytics courses		
IS 3543	Cyber Analytics Policy, Law and Ethics	
IS 4443	Cyber Analytics I	
IS 4503	Cyber Analytics II	
B. Support Work		**6**
Choose 2 courses from BBA Cyber Security Major support work list		
Total Credit Hours		**81**

[1] EGR 1403 and MAT 1093 may be applied to 6 semester credit hours of the University Core Curriculum.

Students are highly encouraged to take Cyber Attack & Defend I & II (IS 4543 and IS 4553) as support work in major if they plan to pursue employment opportunities that involve proactive threat hunting, penetration testing, or intelligence analysis. Students are highly encouraged to take Application Development (IS 3073) as support work in major if they plan to purse employment opportunities that involve programming and/or security development operations (secdevops).

Course Sequence Guide for B.S. Degree in Applied Cyber Analytics

This course sequence guide is designed to assist students in completing their UTSA undergraduate business degree requirements. This is a term-by-term sample course guide. Students must satisfy other requirements in their catalog and meet with their academic advisor for an individualized degree plan. Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

Recommended Four-Year Academic Plan

First Year		
Fall		**Credit Hours**
AIS 1233	AIS: Business (core)	3
WRC 1013	Freshman Composition I (core)	3
MAT 1093	Precalculus (020 core) [1]	3
IS 1003	Unlocking Cyber	3
American History (060 core)		3
	Credit Hours	**15**
Spring		
WRC 1023	Freshman Composition II (010 core)	3
MAT 1213	Calculus I	3
IS 2053	Programming I	3
American History (060 core)		3
Life & Physical Sciences (030 core)		3
	Credit Hours	**15**
Second Year		
Fall		
EGR 1403	Technical Communication (CAO core) [1]	3
IS 3413	Telecommunications and Networking	3
MAT 1223	Calculus II	3
MS 3003	Visualization in Business Analytics	3
STA 3003	Statistical Methods and Applications	3
	Credit Hours	**15**
Spring		
MAT 2253	Applied Linear Algebra	3
Language, Philosophy & Culture (040 core)		3
IS 3513	Information Assurance and Security	3
IS 3063	Database Management for Information Systems	3
STA 4233	Introduction to Programming and Data Management in R	3
	Credit Hours	**15**
Third Year		
Fall		
IS 3423	Network Security	3
POL 1013	Introduction to American Politics (070 core)	3
MS 3073	Business Intelligence and Analytics	3
Life & Physical Sciences (030 core)		3
IS 4023	Applied Big Data with Machine Learning	3
	Credit Hours	**15**
Spring		
IS 3523	Intrusion Detection and Incident Response	3
POL 1133	Texas Politics and Society (070 core)	3
MS 3313	Statistical Modeling for Business Analytics	3
IS 3543	Cyber Analytics Policy, Law and Ethics	3
IS 4043	Natural Language Processing	3
	Credit Hours	**15**
Fourth Year		
Fall		
IS 4233	Cloud Computing	3
IS 3033	Operating Systems and Security	3
IS 4443	Cyber Analytics I	3
CYA Elective		3
Social & Behavioral Sciences (080 core)		3
	Credit Hours	**15**
Spring		
IS 3833	Cyber Operations	3
IS 4503	Cyber Analytics II	3
CYA Elective		3
Creative Arts (050 core)		3
Free elective (to meet 120 hour minimum)		3
	Credit Hours	**15**
	Total Credit Hours	**120**

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- Minor in Information Systems (p. 9)
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Minor in Cyber Security

Code	Title	Credit Hours
A. Required courses		**12**
IS 3413	Telecommunications and Networking	
IS 3423	Network Security	
IS 3513	Information Assurance and Security	
IS 3523	Intrusion Detection and Incident Response	
B. Elective courses		**6**
*Other majors may be required to take additional hours to meet prerequisites, depending on their academic background.		
Select two of the following:		
IS 3033	Operating Systems and Security	
IS 3043	Secure Mobile App Development	
IS 3433	Cyber Crime Investigation Principles	
IS 3533	Cyber Law and Legal System	
IS 3833	Cyber Operations	
IS 4043	Natural Language Processing	
IS 4083	Agile Project Management	
IS 4143	Advanced Telecommunications and Networking	
IS 4223	Emerging Network Technologies	
IS 4233	Cloud Computing	
IS 4463	Web Application Security	
IS 4473	Cyber Security Policy, Compliance, and Risk Assessment	

IS 4483	Digital Forensic Analysis I
IS 4513	Industrial Control Systems Security
IS 4523	Digital Forensic Analysis II
IS 4533	Malware Analysis
IS 4543	Cyber Attack and Defend I
IS 4573	Engaged Cyber Defense
IS 4553	Cyber Attack and Defend II
IS 4563	Mobile Forensics
IS 4643	Research Support for Federal Labs
IS 4963	Special Studies in Cyber Security
IS 4973	Special Studies in Cloud
Total Credit Hours	**18**

To declare a Minor in Cyber Security, obtain advice, or seek approval of course substitutions for course requirements, students must consult their academic advisor.

Minor in Digital Forensics

The Minor in Digital Forensics is open to all majors in the University. Students majoring in Information Systems or Cyber Security will be required to take 18 semester credit hours of coursework.

Code	Title	Credit Hours
Required courses		**12**
IS 3433	Cyber Crime Investigation Principles	
IS 3533	Cyber Law and Legal System	
IS 4483	Digital Forensic Analysis I	
IS 4523	Digital Forensic Analysis II	
*Other majors may be required to take additional hours to meet prerequisites depending on their academic background.		
Elective courses-Select two from the following courses:		**6**
CRJ 3233	Introduction to Forensic Science	
IS 3523	Intrusion Detection and Incident Response	
IS 4533	Malware Analysis	
IS 4563	Mobile Forensics	
Total Credit Hours		**18**

To declare a Minor in Digital Forensics, obtain advice, or seek approval of course substitutions for course requirements, students must consult their academic advisor.

Minor in Information Systems

The Minor in Information Systems is open to all majors in the University. The number of semester credit hours required for a student in the Carlos Alvarez College of Business is 18. Other students may be required to take additional hours, depending on their academic background.

Code	Title	Credit Hours
Required courses		**18**
IS 1003	Unlocking Cyber	
IS 2053	Programming I	
IS 3003	Principles of Information Systems for Management	
IS 3063	Database Management for Information Systems	
IS 3413	Telecommunications and Networking	
IS 4053	Systems Analysis and Design	
Total Credit Hours		**18**

To declare a Minor in Information Systems, obtain advice, or seek approval of course substitutions for course requirements, students must consult their academic advisor.

Minor in Cloud and Data Center Management

The minor in Cloud and Data Center Management is open to all majors in the University. A student majoring in Information Systems or Cyber Security is required to take 18 semester credit hours of coursework. Other majors may be required to take additional hours to meet prerequisites depending on their academic background.

Code	Title	Credit Hours
A. Required courses		**9**
IS 3413	Telecommunications and Networking	
IS 4223	Emerging Network Technologies	
IS 4233	Cloud Computing	
B. Elective Courses		**9**
Choose three courses from the list below:		
IS 3063	Database Management for Information Systems	
IS 3523	Intrusion Detection and Incident Response	
IS 4083	Agile Project Management	
IS 4143	Advanced Telecommunications and Networking	
IS 4973	Special Studies in Cloud	
Total Credit Hours		**18**

To declare a Minor in Cloud and Data Center Management, obtain advice, or seek approval of course substitutions for course requirements, students must consult with their academic advisor.

Minor in Technology Management for Nonbusiness Majors

The Minor in Technology Management for nonbusiness majors is only open to nonbusiness majors in the University. The number of required semester credit hours for this minor is 18.

Code	Title	Credit Hours
A. Required Courses		**15**
ACC 2003	Foundations of Accounting	
FIN 3003	Survey of Finance	
MKT 3013	Principles of Marketing	
MOT 4023	Essentials of Technology Management	
MOT 4143	Introduction to Project Management	
B. Elective course		**3**
Select one of the following:		

MGT 3013	Introduction to Organization Theory, Behavior, and Management	
MOT 4203	Strategic Management of Technology and Innovation	
MOT 4313	Disruptive Innovations	
MS 3403	Logistics Management	
Total Credit Hours		**18**

To declare a Minor in Technology Management, obtain advice, and seek approval of course substitutions for course requirements, students must consult with their academic advisor.

Information Systems (IS) Courses

IS 1003. Unlocking Cyber. (3-0) 3 Credit Hours.
Cybersecurity is a relevant topic for everyone today, personally and professionally. This three-hour course covers core security concepts and discusses common challenges and threats faced by individuals, organizations, and nations through current events, case studies, and career profiles. We offer hands-on labs using virtualization, Linux, and Command Line tools to familiarize students with problem-solving techniques, analytical skills, and report writing, with the aim of increasing awareness of the field and its critical importance to our world. Course Fee: BISP $10; BTSI $15.41; LRB1 $15.41; DL01 $75.

IS 1403. Business Information Systems Fluency. (3-0) 3 Credit Hours. (TCCN = BCIS 1305)
This course concentrates on a set of core computing skills that are essential to student success, such as using word processing, spreadsheets, basic data management, presentation software, and on- and off-campus internet resources. Microsoft Office is required to complete the projects assigned in the course. This is an online course. All coursework (lessons, exams, and projects) is completed online. Course Fee: BISP $10; BTSI $15.41; DL01 $75; LRB1 $15.41.

IS 1413. Excel for Business Information Systems. (3-0) 3 Credit Hours.
This course concentrates on the use of Microsoft Office Excel as a tool for organizing, presenting, and analyzing data. This is an online course. All coursework (lessons, exams, and projects) is completed online. Microsoft Excel is required to complete the projects assigned in the course. Successful completion of this course will help prepare the student for taking the Microsoft Office Specialist (MOS): Microsoft Office Excel Core exam. Students who are MOS certified or have taken an equivalent course that specifically prepares students for the MOS Excel exam can petition for exemption for the course. Students in quantitative majors (such as Accounting, Actuarial Science, Economics, Finance, Operations and Supply Chain Management, Statistics and Data Science, and Business Analytics) are strongly encouraged to take this course in lieu of IS 1403. Course Fee: BISP $10; BTSI $15.41; DL01 $75; LRB1 $15.41.

IS 2053. Programming I. (3-0) 3 Credit Hours.
This course introduces several fundamental programming constructs and practices, including logic, algorithms, pseudocode, syntax, and code readability. Control structures, arithmetic and logical operators, functions, arrays/lists, regular expressions, classes/objects, integrated development environments, and exception handling are covered in this course. The emphasis will be on building problem-solving and coding skills that apply to any language. (Formerly titled "Programming Languages I with Scripting"). Course Fee: BISP $10; BTSI $15.41; LRB1 $15.41; DL01 $75.

IS 2063. Programming II. (3-0) 3 Credit Hours.
Prerequisite: IS 2053 or equivalent with a grade of "C-" or better. The course focuses on high-level programming constructs in an object-oriented framework for developing business software that employs the programming language's basic security features. Students will examine and use data structures, built-in libraries, file and text processing (which includes regular expressions), and exception handling. (Formerly titled "Programming Languages II with Java"). Course Fee: BISP $10; BTSI $15.41; LRB1 $15.41; DL01 $75.

IS 3003. Principles of Information Systems for Management. (3-0) 3 Credit Hours.
An overview of fundamental MIS concepts within a framework for describing and analyzing managerial/organizational information needs. Includes coverage of hardware and software tools, information structures, various types of information systems, and formal problem-solving techniques. Issues related to organizational controls, security, globalization, collaboration, and ethics as a result of changing technologies are discussed. A variety of assessment methods will be assigned to illustrate the use of specific tools and techniques for problem-solving. This course has Differential Tuition. Course Fee: DL01 $75.

IS 3033. Operating Systems and Security. (3-0) 3 Credit Hours.
Prerequisite: IS 1003 with a grade of C- or better. IS 3033 is a hands-on course with an emphasis on the real-world security and performance challenges of operating systems (OSs). Throughout the course, students will be introduced to fundamental OS concepts such as process scheduling, memory management, I/O devices, and file systems. The lab exercises in this course provide students with a comprehensive practice in hardening the essential components of a specified OS (Unix-like or Windows) through secure operation and maintenance, secure server configuration, system-level firewalls, kernel security module, logging, anti-malware measures, and more. (Formally titled "Operating Systems Security"). This course has Differential Tuition. Course Fee: DL01 $75.

IS 3043. Secure Mobile App Development. (3-0) 3 Credit Hours.
Prerequisite: IS 2063 (IS 2041 and IS 2043 in previous catalogs) with a grade of C- or better. As mobile devices such as smartphones and tablets become ubiquitous, the demand for mobile apps and developers who specialize in mobile technology also surges. This course teaches students how to develop a mobile app in an advanced development environment (e.g., Android Studio) and principles of secure software engineering. The course will cover requirements analysis, interface design, functionality development, testing vulnerabilities, data security and other secure software design strategies with a focus on the usability of mobile apps in the real world. This course can be an elective for the information systems major and cyber security major and minor. This course has Differential Tuition.

IS 3053. Fundamentals of Cyber Security. (3-0) 3 Credit Hours.
This course covers core cyber security terminology, concepts, and challenges faced by individuals, organizations, and nations through case studies and discussions. Application to business environments will be emphasized with hands-on exercises in areas such as network/device security hygiene, search techniques, incident response, and risk assessment. The overall aim of the course is to familiarize students with security techniques and strategies needed across a broad range of industry sectors. Credit for this course cannot be counted toward the B.B.A. in Information Systems or the B.B.A. in Cyber Security. This course has Differential Tuition.

IS 3063. Database Management for Information Systems. (3-0) 3 Credit Hours.
Prerequisite: IS 1403 or IS 1413 with a grade of C- or better. A study of database management systems (DBMS) features, functions, and architecture, including database conceptual design, data models, entity relationship diagrams, database query design, and database administration. A contemporary DBMS product will be used to illustrate principles in a relational database. This course has Differential Tuition. Course Fee: ISCS $75; DL01 $75.

IS 3073. Application Development. (3-0) 3 Credit Hours.
Prerequisite: IS 2053 or equivalent with a grade of C- or better. This course examines the challenges, techniques, and methodologies involved in building, testing, maintaining, and enhancing software applications and packages. Students will address implementation and deployment issues; analysis and testing of code will be included. A brief introduction to data analytics is included with reference to how such analytics support application development and operations. This course has Differential Tuition.

IS 3100. Signature Experience. (0-0) 0 Credit Hours.
Prerequisite: Consent of instructor. The Signature Experience in the Department of Information Systems and Cyber Security is designed to enhance a student's degree program with a project in a category of their choice. Projects may include activities focused on leadership, research, competitions, global studies, peer mentoring, community outreach, and more. Students will work with faculty and/or staff during their Signature Experience and submit a portfolio piece that reflects their work at the end of the semester.

IS 3413. Telecommunications and Networking. (3-0) 3 Credit Hours.
This course presents the principles of data transmission in telecommunications and networks. Topics include network hardware and topologies, the OSI model, the TCP/IP stack, routing protocols, and IP addressing and subnetting. We will examine Ethernet, wireless, radio, mobile, SDWAN, VoIP, IoT, and cloud/edge communications and protocols alongside best practices in network management and security. Students will apply their knowledge in hands-on labs and exercises. (Formerly titled "Introduction to Telecommunications for Business." Same as IS 6113. Credit cannot be earned for both IS 3413 and IS 6113.) This course has Differential Tuition. Course Fee: DL01 $75; ISCS $75.

IS 3423. Network Security. (3-0) 3 Credit Hours.
Prerequisite: IS 3413 with a grade of "C-" or better. The course provides a foundation in networking technologies that are core to creating secure networks. Topics included in this course are basic cryptography, secure networking protocols, logical and physical security management, and security devices. Relation between these technologies and operational and implementation issues for these technologies will also be discussed. This course has Differential Tuition. Course Fee: DL01 $75.

IS 3433. Cyber Crime Investigation Principles. (3-0) 3 Credit Hours.
The digital forensic investigation process involves organizational preparation, incident response, data collection, data analysis, and communication of findings. This course will teach students how to prepare for incidents, how to respond to incidents, and how to reliably collect digital data. Students will be introduced to various types of storage media and sources of volatile data. Students will also be introduced to fundamental legal issues related to digital forensics. (Formerly titled "Introduction to Digital Forensics." Same as ACC 3433. Credit cannot be earned for both IS 3433 and ACC 3433.) This course has Differential Tuition. Course Fee: ISCS $75; DL01 $75.

IS 3513. Information Assurance and Security. (3-0) 3 Credit Hours.
Prerequisite: IS 3413 with a grade of "C-" or better. This course will provide the student the opportunity to learn about the basic elements that comprise Information Assurance Security. An in-depth presentation of information assurance topics such as fraud, eavesdropping, traffic analysis, intrusion detection and prevention, hacking, viruses, cryptography, risk management, and secure architectures will be discussed. (Same as IS 6213. Credit cannot be earned for both IS 3513 and IS 6213.) This course has Differential Tuition. Course Fee: DL01 $75.

IS 3523. Intrusion Detection and Incident Response. (3-0) 3 Credit Hours.
Prerequisite: IS 3513 with a grade of "C-" or better. This course will provide the student with the opportunity to learn about the elements that comprise intrusion detection and incident response. It provides an in-depth look at intrusion detection methodologies, tools, and approaches to handling intrusions when they occur. It examines the laws that address cyber crime and intellectual property issues, and includes a study of proper computer and network forensics procedures to aid in the identification and tracking of intruders and in the potential prosecution of criminal activity. (Same as IS 6223. Credit cannot be earned for both IS 6223 and IS 3523.) This course has Differential Tuition. Course Fee: DL01 $75; ISCS $75.

IS 3533. Cyber Law and Legal System. (3-0) 3 Credit Hours.
An introductory course in laws and legal issues that affect law enforcement, businesses, and investigators related to the preservation, collection, and analysis of digital data. Students will examine computer crime laws, civil and criminal laws that often involve electronic evidence, search and seizure of electronic evidence, judicial issues involving the admissibility of electronic evidence and related testimony, and legal issues involved with electronic surveillance. (Same as IS 6763. Credit cannot be earned for both IS 3533 and IS 6763.) This course has Differential Tuition. Course Fee: DL01 $75.

IS 3543. Cyber Analytics Policy, Law and Ethics. (3-0) 3 Credit Hours.
There are numerous policy, legal, and ethical issues that surround the collection, warehousing, and analysis of cyber data, which includes both system and user data. Further, there are policy and legal issues that impact whether data even exists to be collected and analyzed. Students will be given the opportunity to learn how to write, implement, and apply cyber analytics policy. Legal permissions and constraints involving electronic data collection, aggregation, and analysis will be discussed. Critical analysis exercises will be provided involving privacy concerns and ethical issues that arise with cyber. This course has Differential Tuition.

IS 3833. Cyber Operations. (3-0) 3 Credit Hours.
Prerequisite: IS 3523 with a grade of "C-" or better. This course investigates cyber operations, defining terms and discussing modern defensive and offensive cyber security strategies. Enterprise-level network protection will be addressed in the context of the cyber security operations center (CSOC), to include capabilities and technologies as well as organization and policies. Offensive cyber operations will be discussed in the context of red teaming and aggressor operations. Recent/current events will be examined as case studies. This course has Differential Tuition. Course Fee: ISCS $75.

IS 4013. Information Technology Administration I. (3-0) 3 Credit Hours.
This course educates students on host, network, platform, and enterprise-level system administration and integration through hands-on projects. Topics may include but are not limited to enterprise infrastructure design, system requirements and selection, and system configuration and management. Students will also learn about system reliability and service provision. This course has Differential Tuition. Course Fee: DL01 $75.

IS 4023. Applied Big Data with Machine Learning. (3-0) 3 Credit Hours.
Prerequisite: IS 2053 with a grade of C- or better. This course provides an overview of machine learning techniques to explore, analyze, and leverage data. Students will be introduced to tools and algorithms they can use to create machine learning (ML) models that learn from data, and to scale those models up to big data problems. ML concepts covered include neural networks, support vector machines, and random forests. This course emphasizes a focus on the three major steps in the data analysis pipeline: 1) Data collection methods and techniques, 2) Data storing and feature engineering methods, and 3) Data modeling (supervised and unsupervised methods). The language of choice for this course is Python. This course has Differential Tuition. Course Fee: ISCS $75.

IS 4043. Natural Language Processing. (3-0) 3 Credit Hours.
Prerequisite: IS 2053 with a grade of C- or better. Natural Language Processing (NLP) employs computational tools to process, understand, and communicate using human (natural) language. NLP is a multi-disciplinary subject applicable to computation social science, humanities, biomedical informatics, business, cybersecurity, and a wide range of other fields. In this class, students will (1) gain hands-on experience implementing traditional NLP applications, including, but not limited to, text classification, part-of-speech tagging, parsing, coreference resolution, and machine translation, and (2) practice applying NLP techniques to real-world problems. This course has Differential Tuition.

IS 4053. Systems Analysis and Design. (3-0) 3 Credit Hours.
Prerequisite: IS 3063 with a grade of "C-" or better. An introduction to the systems analysis and design process. Topics include project selection, feasibility analyses, project management, problem and scope definition, modeling, interface design, and system implementation. Cyber security concerns that may arise during the systems development lifecycle are also addressed. This course has Differential Tuition. Course Fee: DL01 $75.

IS 4063. Advanced Topics in Information Systems. (3-0) 3 Credit Hours.
Prerequisite: 15 semester credit hours of information systems courses (excluding IS 1403, IS 1413, and IS 3003). Survey of recent developments in information technology with emphasis on the Electromagnetic Spectrum (EMS) and Radio Frequency (RF) applications. Analysis will focus on applications in the business community and theoretical developments that relate to those applications. This course has Differential Tuition. Course Fee: ISCS $75; DL01 $75.

IS 4083. Agile Project Management. (3-0) 3 Credit Hours.
This introductory course presents concepts and techniques for leading agile teams in various types of projects in organizations including software development, engineering, construction, and product development, as well as science and technology-focused efforts. The course will provide students the opportunity to develop an agile mindset and a range of adaptive skills, including agile methodologies, practices, and values that are associated with achieving higher levels of performance and customer satisfaction. This course is structured around the concepts and skills covered in the Project Management Institute's (PMI) PMI-ACP certification exam. (Same as IS 6083. Credit cannot be earned for both IS 4083 and IS 6083.) This course has Differential Tuition.

IS 4113. Information Technology Administration II. (3-0) 3 Credit Hours.
Prerequisite: IS 4013 with a grade of C- or better. This course educates students on advanced host, network, platform, and enterprise-level administration and integration through hands-on projects. Topics may include but are not limited to database administration, server administration, enterprise-level access control and group policy management, virtualization, enterprise data storage and retrieval, and emergent technology integration. This course has Differential Tuition.

IS 4143. Advanced Telecommunications and Networking. (3-0) 3 Credit Hours.
Prerequisite: IS 3413 with a grade of "C-" or better. This course covers a variety of networking technologies and protocols that intersect over wide-area networks (WANs), mobile, Internet of Things (IoT), and the cloud. Students will examine topics such as software-defined networking, various wireless protocols (cellular, Wi-Fi, Bluetooth, etc.), and personal and private/public sector uses of low-power devices. The course will also address how distributed networking technologies (e.g., fog and edge) work with the cloud to transmit data over mobile and IoT devices. (Formally titled "Wide Area Networks"). This course has Differential Tuition.

IS 4183. Advanced Database Concepts and Applications. (3-0) 3 Credit Hours.
Prerequisite: IS 3063 with a grade of "C-" or better. Databases play a critical role in the business operations of most organizations. This course provides an in-depth coverage on concepts governing the design and management of database systems. Topics include data modeling, database design, administration, optimization and performance evaluation, SQL language, procedures, functions and triggers. Students will have the opportunity to learn how to design and build modern database systems through a set of hands-on exercises and projects using MS SQL Server, Oracle and other contemporary database software. The course also covers some advanced topics such as database security, database connectivity and Web applications. This course has Differential Tuition. Course Fee: ISCS $75.

IS 4223. Emerging Network Technologies. (3-0) 3 Credit Hours.
This class will look at various technologies that are used in data centers and networks today. Topics include cloud infrastructure, virtual machines, storage area networks, software-defined networks, and remote systems management. Security issues will be an important part of the course. New wireless technologies along with new data storage and retrieval techniques and new hardware, will be discussed. This course has Differential Tuition. Course Fee: DL01 $75; ISCS $75.

IS 4233. Cloud Computing. (3-0) 3 Credit Hours.
The course provides an introduction to cloud computing and cloud security. The course covers the foundational concepts required to securely operate in the cloud, including cloud architectures, guiding security design principles, design patterns and workflows, industry standards, and applied technologies, with an emphasis on established methodologies and best practices. Students will work with real-world case studies and hands-on exercises. This course has Differential Tuition. Course Fee: BISP $10; BTSI $15.51; LRB1 $15.41; DL01 $75.

IS 4443. Cyber Analytics I. (3-0) 3 Credit Hours.
Prerequisite: IS 4023 with a grade of C- or better, and IS 3523 with a grade of C- or better. This integrative course will build upon students' cybersecurity and data analytics knowledge. Students will be given an opportunity to gain valuable experience with industry standard tools, platforms, and business processes for collecting, curating, sharing, and analyzing cyber data to proactively hunt for, reactively respond to, and investigate cyber threats. Analysis of low-level data from a wide variety of devices and sensors onto cyber threat frameworks for sense making in triaging and event reconstruction will be presented. Students will have an opportunity to gain extensive hands-on experience with proprietary and open-source cyber analytics tools. This course has Differential Tuition.

IS 4463. Web Application Security. (3-0) 3 Credit Hours.
Prerequisite: IS 2063 with a grade of "C-" or better. The security issues related to web applications will be discussed in this course. Topics include web application, authentication, and authorization, browser and web database security principles, and API security. Various web application security risks from the OWASP 10 will be examined through case studies and labs, such as broken access controls, code injection, cross-site scripting, server-side request forgery, and insecure design. (Same as IS 6463. Credit cannot be earned for both IS 6463 and IS 4463.) This course has Differential Tuition. Course Fee: DL01 $75.

IS 4473. Cyber Security Policy, Compliance, and Risk Assessment. (3-0) 3 Credit Hours.
This course will examine how policies, compliance, and risk assessments affect information assurance and cyber security practices. This course will align security with business strategy through the identification and development of administrative, physical, and technical policies to mitigate risk exposure, minimize liability, and maintain regulatory compliance for global organizations, government entities, and key industry sectors such as healthcare and finance. Cyber security frameworks, implementation issues, and current case studies will be included along with hands-on policy writing. (Same as IS 6473. Credit cannot be earned for both IS 6473 and IS 4473.) This course has Differential Tuition. Course Fee: DL01 $75.

IS 4483. Digital Forensic Analysis I. (3-0) 3 Credit Hours.
Prerequisites: Students may not enroll without 60 credit hours completed and without nine (9) hours of upper-division IS and/or CS coursework. An introductory course in digital forensic analysis. This course examines the fundamental data structures, software tools, and forensic analysis techniques commonly used to locate and recover trace evidence of crimes involving computers. This course focuses on file system forensic analysis of computer hosts and associated media. The tools of collecting, examining, and evaluating data in an effort to establish intent, culpability, motive, means, methods, and loss resulting from such crimes will be examined. (Same as IS 6483. Credit cannot be earned for both IS 4483 and IS 6483.) Generally offered: Fall. This course has Differential Tuition. Course Fees: BISP $10; BTSI $15.41; LRB1 $15.41; DL01 $75; ISCS $75.

IS 4503. Cyber Analytics II. (3-0) 3 Credit Hours.
Prerequisite: IS 4443 with a grade of C- or better. This capstone course integrates cybersecurity and data analytics knowledge. Students focus on the human aspect of cyber analytics, both behavioral analytics involving users and threat actors, as well as the humans to which findings need to be presented and communicated from a risk, intelligence, and business perspectives. Students will be given an opportunity to learn how to apply cyber analytics concepts holistically across multiple contexts. Additionally, students will explore advanced topics, such as the role of artificial intelligence in increasingly autonomous cyber systems for intrusion detection, prevention, investigation, attribution, and other current and potential uses. This course has Differential Tuition.

IS 4513. Industrial Control Systems Security. (3-0) 3 Credit Hours.
Prerequisite: IS 3513 with a grade of "C-" or better. Many of the critical infrastructure systems contain a System Control And Data Acquisition (SCADA) component. Frequently, the control systems are remotely accessed and therefore become the focal point for attack. This course examines the control system components from the standpoint of vulnerability and protection. System architectures will be discussed. Current events will also be part of the class. (Same as IS 6513. Credit cannot be earned for both IS 6513 and IS 4513.) This course has Differential Tuition. Course Fee: ISCS $75.

IS 4523. Digital Forensic Analysis II. (3-0) 3 Credit Hours.
Prerequisite: IS 4483 with a grade of C- or better. This course examines advanced digital forensic analysis topics, tools, techniques, and control mechanisms. Advanced topics include operating system artifacts, non-standard file systems, mobile devices, malware, and volatile memory. Students will gain experience with state-of-the-art forensics tools and techniques needed to successfully investigate illegal activities perpetuated through the use of information technology. This course has Differential Tuition. Course Fee: DL01 $75; ISCS $75.

IS 4533. Malware Analysis. (3-0) 3 Credit Hours.
Prerequisite: IS 3033 with a grade of "C-" or better. This class is designed to introduce students to concepts, tools, and techniques associated with modern malicious code analysis. The course will examine the methods employed by malicious actors to prevent analysis and neutralization of their exploits and discuss ways of leveraging resources and tools to effectively examine malicious code. Safe handling practices for malware analysis such as sandboxing, virtualization, and system isolation will be taught/practiced throughout the course. This course has Differential Tuition. Course Fee: ISCS $75.

IS 4543. Cyber Attack and Defend I. (3-0) 3 Credit Hours.
Prerequisite: IS 3413 with a grade of C- or better; students may not enroll without 60 credit hours completed and without nine (9) hours of upper-division IS and/or CS coursework. This course will bridge the concepts of implementing a secure network with actual cyber threats. Students will learn the necessary skills to implement key IT system components, create security policies, and understand the background of what hackers do to mandate such security measures. Students will conduct red team assessments against common infrastructure components, and monitor residual effects of attacks. This course has Differential Tuition. Course Fee: ISCS $75; DL01 $75.

IS 4553. Cyber Attack and Defend II. (3-0) 3 Credit Hours.
Prerequisite: IS 4543 with a grade of C- or better. This course will build on the cyber themes and skillsets learned in prior classes to conduct threat hunts to detect advanced persistent threats. Students will learn the necessary skills to detect networking, operating system, and application-level exploitation. Students will utilize advanced community penetration testing tools to emulate advanced persistent threats. Students will leverage community security monitoring and log management tools to conduct threat hunting. This course has Differential Tuition.

IS 4563. Mobile Forensics. (3-0) 3 Credit Hours.
Prerequisite: IS 4483 with a grade of C- or better. This course is a project-driven, hands-on study of mobile devices from a forensics perspective. Students will implement various techniques to collect and analyze information from mobile devices used in forensic investigations. Students will learn fundamental mobile device concepts, techniques, and tools needed to acquire and analyze common mobile devices in a forensically sound manner. This course has Differential Tuition.

IS 4573. Engaged Cyber Defense. (3-0) 3 Credit Hours.
Prerequisite: IS 2053, IS 3513, and IS 3033 with a grade of C- or better. This course introduces students to cyber threat hunting, which involves proactively searching for cyber threats and attacks on computer networks and systems. Students will learn and experience techniques and tools used in cyber threat hunting, understand threat actor tactics, techniques, and procedures, and develop skills necessary to identify, track, and mitigate cyber threats. Topics include Indicators of Compromise (IoCs), network traffic analysis, log analysis, and threat intelligence. This course has Differential Tuition.

IS 4583. Healthcare Information Systems and Cyber Security. (3-0) 3 Credit Hours.
This course provides students with an overview of healthcare information, as well as information technology and systems used to collect and manage such information for patient care and healthcare administration. This includes, but may not be limited to, regulated patient health information (PHI), clinical trial information, healthcare financial systems, and electronic health records (EHR). Students will also become familiar with the regulatory, privacy, and other information and cybersecurity-related controls, risks, and mitigation strategies for such information, technology, and systems. This course has Differential Tuition.

IS 4643. Research Support for Federal Labs. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor. This course is a research-based course that addresses research problems that are of interest to subject matter experts (SMEs) who work for the Federal labs. Students work closely with the SME to help solve these important concerns. The research problems cover a wide variety of issues, including conducting a literature review, developing code, proposing a new approach to a solution, and/or testing a solution. Weekly coordination with a Technical Director from a Federal Lab is part of the process. This course has Differential Tuition.

IS 4893. Cyber Security Capstone. (3-0) 3 Credit Hours.
Prerequisites: IS 3513 with a grade of "C-" or better and 15 hours of upper-level IS courses, excluding IS 3003. This course should be taken during the final semester. This course builds upon the material in prior cyber security classes with an examination of the cybersecurity tactics, techniques, and procedures involved in executing cyber security in various business settings. Students are required to integrate their functional knowledge and understanding of the global cyber threat environment with advanced cybersecurity techniques, and determine effective ways to reduce risk, detect intrusions, and resolve complex breaches so that organizations can operate in high threat environments. Strong problem solving skills, creative analytical procedures, and effective communication in current cybersecurity scenarios are emphasized. This course has Differential Tuition.

IS 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisite: A 3.0 Alvarez College of Business grade point average, and approval in writing from the instructor, the Department Chair, and the Dean of the Alvarez College of Business. Independent research in an approved topic under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition.

IS 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisite: A 3.0 Carlos Alvarez College of Business grade point average, and approval in writing from the instructor, the Department Chair, and the Dean of the Carlos Alvarez College of Business. Independent research in an approved topic under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition.

IS 4933. Internship in Information Systems. (0-0) 3 Credit Hours.
Prerequisite: 6 semester credit hours of information systems courses (excluding IS 1403, IS 1413, and IS 3003), a 2.5 UTSA grade point average, and approval in writing from the instructor, the Department Chair, and the Associate/Assistant Dean of Undergraduate Studies in the Carlos Alvarez College of Business. Directed internship of at least 160 hours of work under the supervision of a professional, providing students with opportunities to apply concepts, principles, and techniques learned in the classroom. Written report required. A proposal form must be completed and approved prior to registration. Internship may not be repeated for credit. This course has Differential Tuition.

IS 4943. Internship in Cyber Security. (0-0) 3 Credit Hours.
Prerequisite: 6 semester credit hours of information systems courses (excluding IS 1403, IS 1413, and IS 3003), a 2.5 UTSA grade point average, and approval in writing from the instructor, the Department Chair, and the Associate/Assistant Dean of Undergraduate Studies in the Carlos Alvarez College of Business. Directed internship of at least 160 hours of work under the supervision of a professional, providing students with opportunities to apply concepts, principles, and techniques learned in the classroom. Written report required. A proposal form must be completed and approved prior to registration. Internship may not be repeated for credit. This course has Differential Tuition.

IS 4953. Special Studies in Information Systems. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An organized course offering specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: DL01 $75.

IS 4963. Special Studies in Cyber Security. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An organized course offering specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition.

IS 4973. Special Studies in Cloud. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An organized course offering specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition.

Management of Technology (MOT) Courses

MOT 4023. Essentials of Technology Management. (3-0) 3 Credit Hours.
This survey course provides an overview of the issues that impact technology management. All technology management subsystems are included: strategy, technology, resource, organizational, project, and people. The course is designed to help students develop the systems thinking necessary to successfully interact with the burgeoning technological world. The course will also provide the opportunity for students to develop the entrepreneurial skills important in managing the design, development, and commercialization of technological goods and services. This course has Differential Tuition. Course Fee: DL01 $75.

MOT 4143. Introduction to Project Management. (3-0) 3 Credit Hours.
This introductory course presents concepts and techniques for the management of many types of projects including engineering, construction, product development, as well as science and technology projects. The course is designed to help students develop project planning skills including scope definition, scheduling, cost-estimating and risk assessment. The course will also provide the opportunity for students to develop skills in support of project leadership, team building and communication. This course has Differential Tuition.

MOT 4153. Project Management Certification. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. This course is a comprehensive coverage of project management designed to give students the opportunity to prepare for the Project Management Professional (PMP) and Certified Associate in Project Management (CAPM) certification exams. The course is structured around the Project Management Institute's (PMI) Project Management Body of Knowledge and Agile Practice Guide, emphasizing domains, tasks, and enablers associated with the core project management processes as described in PMI's published exam content outline. Students will also complete diagnostics exam instruments and practice exams. This course has Differential Tuition.

MOT 4203. Strategic Management of Technology and Innovation. (3-0) 3 Credit Hours.
This course examines the issues involved in the strategic management of technology in contemporary business organizations. The course will examine new product development, emerging technologies and product portfolios; and will explore the dynamics of innovation in the firm. This course has Differential Tuition. Course Fee: BISP $10; BTSI $15.41; LRB1 $15.41.

MOT 4313. Disruptive Innovations. (3-0) 3 Credit Hours.
This survey course focuses on technologies that may transform society and improve quality of life: the emphasis is on the nexus among biotechnology, information systems, materials, and renewable energy. The course will help students refine the systems thinking necessary to connect technology with users: it investigates the barriers that entrepreneurs face during commercialization. Cooperative learning is a defining characteristic of the course. This course has Differential Tuition. Course Fee: BISP $10; BTSI $15.41; LB01 $15.41.

MOT 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisite: Approval in writing from the instructor, the Department Chair, and the Dean of the Carlos Alvarez College of Business. Independent research in a management of technology topic under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: BISP $10; BTSI $15.41.

MOT 4912. Independent Study. (0-0) 2 Credit Hours.
Prerequisite: Approval in writing from the instructor, the Department Chair, and the Dean of the Carlos Alvarez College of Business. Independent research in a management of technology topic under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: BISP $10; BTSI $15.41.

MOT 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisite: Approval in writing from the instructor, the Department Chair, and the Dean of the Carlos Alvarez College of Business. Independent research in a management of technology topic under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition.

MOT 4951. Special Studies in Management of Technology. (1-0) 1 Credit Hour.
An organized course offering specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: DL01 $25.

MOT 4952. Special Studies in Management of Technology. (2-0) 2 Credit Hours.
An organized course offering specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: BISP $10; BTSI $15.41; LRB1 $15.41.

MOT 4953. Special Studies in Management of Technology. (3-0) 3 Credit Hours.
An organized course offering specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: BISP $10; BTSI $15.41; LRB1 $15.41.