Department of Mathematics, Computer Science, and Cybersecurity Program

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MISSION STATEMENT: COMPUTER SCIENCE

The Computer Science program at Assumption University serves all students interested in computer science, computers, and their applications in a supportive and stimulating learning environment. As the science of computer technology, we support the liberal arts mission of the university through the Core Curriculum. As a source of computing skills, we offer courses supporting the development of technical proficiency. For those students who become majors or minors in computer science, we seek to develop their programming skills, their knowledge of computer hardware and software, and an appreciation of the social and ethical implications of technology. The major provides a foundation for a variety of professional careers in the computer industry and for graduate study in computer science.

MISSION STATEMENT: MATHEMATICS

The Mathematics program at Assumption University serves all students interested in mathematics and its applications in a supportive and stimulating learning environment. As mathematics is a founding discipline of the liberal arts, we support the mission of the university through our course offerings in the Core Curriculum. As mathematics is the language of science and quantitative analysis, we offer courses for majors in the sciences and business studies. For those students who become majors or minors in mathematics, we seek to develop their problem-solving skills, their reasoning abilities, and their knowledge of the various fields of mathematics. The major provides a foundation for professional careers, especially the teaching profession, and for graduate study in mathematics.

MAJOR IN COMPUTER SCIENCE (15)

The major consists of a total of fifteen (15) required courses, which comprise seven specifically required courses in computer science, five electives in computer science, and three courses in mathematics:

REQUIRED COURSES (10)

First Year/Sophomore:

CSC 117	Introduction to Programming
CSC 250	Intermediate Programming
CSC 305	Data Structures*
CSC 260	Command Line Interfaces
MAT 117–118	Calculus I and II
	OR
MAT 131–132	Elementary Calculus I and II
MAT 202	Discrete Structures

Sophomore / Junior:

CSC 230	Networking and Data Communication
CSC 231	Computer Architecture**
CSC 321	Database Management Systems**

ELECTIVES (5)

A minimum of five additional courses chosen from computer science courses numbered above 205 or MAT 356 Numerical Analysis or PHY 213 Introduction to Engineering.
The required courses are offered every year, excepting CSC 231 and CSC 321. These courses and the elective courses are offered in alternate years. Students should consult with an advisor in the department to plan their program.

In addition to the 15 courses taken to satisfy the requirements listed above for the major, CSC majors are encouraged to take MAT 203 Linear Algebra and MAT 208 Probability Theory.

** If necessary, may be taken in the fall of junior year.*
*** If not offered during sophomore year, must be taken during junior year.*

MAJOR IN CYBERSECURITY (14)

Cyberspace is a dynamic and evolving ecosystem, with complex, multifaceted networks that connect individuals, organizations and national and international entities. However, cyberspace's expansion presents new weaknesses to exploit, making it vulnerable to intrusion and exploitation. Cyber threats and vulnerabilities have grown exponentially with the explosion of technology and connectedness, affecting individuals, organizations, and nations alike. And while cyber threats and vulnerabilities challenge our economic prosperity, organizational sustainability and individual identity and privacy, they have also emerged as a leading threat to national security.

The Assumption University Bachelor of Science in Cybersecurity offers a technology-based education, using methods in computing and information science, engineering, social science and technology management that also foster innovation and entrepreneurship in the digital information economy. The faculty, drawn from different areas of expertise in cybersecurity, will engage students in finding solutions to emerging global cyber threats. At Assumption, a Bachelor of Science in Cybersecurity will educate the next generation of leaders and architects in cybersecurity, who possess technological expertise and practical training to help secure, develop, and sustain the cyberspace ecosystem.

LEARNING GOALS

Assumption University Cybersecurity program graduates will be able to:

- Apply knowledge of computing and information technologies and use software development and security analysis tools to produce effective designs and solutions for specific cybersecurity problems within a variety of computing platforms and employing an approved secure systems development process model;
- Identify, analyze, and synthesize scholarly and professional literature relating to the fields of cybersecurity, information security, or information assurance, to help solve specific problems and to stay abreast of the rapidly changing security context;
- Participate as an active and effective member of a project team engaged in achieving specific computer-based cybersecurity results or solutions;
- Communicate, both orally and in writing, and negotiate with colleagues and other stakeholders including employees, managers, and executives within and between organizations;
- Demonstrate sensitivity to and sound judgment on ethical issues as they arise in cybersecurity and will adhere to accepted norms of professional responsibility;
- Integrate their technical expertise with knowledge from other disciplines, such as computer science, data analytics, economics, management science, psychology and human factors, to arrive at practical cybersecurity solutions that are effective in real organizations; and
- Use appropriate tools to prevent, detect, respond, and recover from cyber-attacks.

The Bachelor of Science in Cybersecurity comprises 14 required courses: one course in Statistics, three courses in Computer Science; four Cybersecurity Core Courses; and six advanced courses in Cybersecurity including an Independent Cybersecurity Project or Internship.

REQUIRED COURSES (14)

First Year

ECO 115	Statistics, or PSY 224, or SOC 300
CSC 117	Introduction to Programming, or CSC 120 Statistical Programming
CYB 115	Cybersecurity Fundamentals

Sophomore Year

CSC 321	Database Management Systems
CSC/CYB 230	Networking and Data Communications
CSC/CYB 235	Securing Wired and Wireless Networks
CYB 265	Operating Systems Administration
CSC 303	Operating Systems

Junior Year

CYB 304	Cryptography
CYB 318	Software and Application Security
CYB 328	Computer, Network Forensics and Digital Investigations
CYB 401	Preparing for Cyber Disasters

Senior Year

CYB 338	Ethical Hacking
CYB 438	Independent Cybersecurity Project or Internship

MINOR IN COMPUTER SCIENCE (8)

A minor in computer science consists of eight courses, which must include:

CSC 117	Introduction to Programming
CSC 250	Intermediate Programming
CSC 305	Data Structures
MAT 117–118	Calculus I and II
	OR
MAT 131–132	Elementary Calculus I and II
MAT 202	Discrete Structures

The remaining two courses may be chosen from the computer science courses numbered above 250.

MINOR IN INFORMATION TECHNOLOGY (6)

The IT Minor consists of six courses, which comprise two required courses, and four electives taken in the Applied Track (for students majoring in Accounting); the Online Track (for students majoring in Marketing or Organizational Communication) or the Analytical Track (for students majoring in Management or International Business).

REQUIRED COURSES (2)

1)	CSC 113	Introduction to Computer Science
2)	ACC 211	Accounting Information Systems
		OR
	MGT/MKT 302	Management Information Systems

ELECTIVES (4)

Applied Track Electives:

CSC 117, CSC 118, CSC 175, CSC 250, CSC 301, CSC 315, MKT 326, MKT 327

Online Track Electives:

CSC 117, CSC 118, CSC 175, CSC 250, CSC 301, CSC 315, MKT 326, MKT 327

Analytical Track Electives:
CSC 117, CSC 175, CSC 250, CSC 261, CSC 301, CSC 327, MKT 326

SOFTWARE DEVELOPMENT

Students interested in software developer positions should consult with the Chairperson of the Department of Mathematics and Computer Science to plan a course of study. Suggested coursework includes a major in Computer Science taking the electives CSC 301 Systems Analysis and Design and CSC 317 Java Programming.

MAJOR IN MATHEMATICS (12)

The major consists of a total of twelve (12) required courses, which comprise eight specifically required courses, four electives, and a comprehensive examination.

REQUIRED COURSES (8)

First Year/Sophomore

MAT 131–132	Honors Elementary Calculus I and II*
	OR
MAT 117–118	Calculus I and II
CSC 117	Introduction to Programming
MAT 231–232	Calculus III and Multivariable Calculus (If necessary, may be taken in junior year.)
MAT 202	Discrete Structures
MAT 203	Linear Algebra

Senior Year

MAT 401	Mathematics Seminar, offered fall only
Senior Mathematics Assessment	

ELECTIVES (4)

A minimum of four additional mathematics courses numbered above 200 or PHY 213 Introduction to Engineering. At least two electives must be 300-level courses, including at least one course chosen from:

MAT 332 Real Analysis
MAT 351 Modern Algebra I
MAT 358 Topology

SENIOR MATHEMATICS ASSESSMENT

Each mathematics major must pass a comprehensive examination administered at the end of the fall or the spring semester of the senior year. The exam is based on 8 topics covered in the required mathematics courses. Frequently included topics are Theory of Differentiation; Differentiation Techniques; Theory of Integration; Integration Techniques; Sequences and Series; Discrete Mathematics; Linear Algebra; and topics from the Mathematics Seminar.

The required courses are offered every year. Elective courses are offered in alternate years. Students should consult with an advisor in the department to plan their program.

**Students considering a major in mathematics are encouraged to take MAT 131–132 rather than MAT 117–118 in their first year.*

MAJOR IN MATHEMATICS, ELEMENTARY EDUCATION TRACK (10)

The Elementary Track applies only to those students who are pursuing a concurrent Major in Education with a licensure emphasis in Elementary (1–6). If a student withdraws from the Education Major, then the option to pursue the Elementary Track in the Mathematics Major no longer applies. Mathematics Majors who are pursuing licensure in Middle/Secondary Education (5–8; 8–12) would still take the standard 12 courses required Mathematics Major, as given above.

REQUIRED COURSES (6)

First Year/Sophomore

MAT 131–132 Honors Elementary Calculus I and II

OR

MAT 117–118 Calculus I and II

MAT 150 Numbers and Operations for Educators
MAT 202 Discrete Structures
MAT 203 Linear Algebra
MAT 231 Intermediate Calculus I

Senior Year

Senior Mathematics Assessment

ELECTIVES (4)

A minimum of four additional mathematics courses numbered above 200. At least two of these courses must be at the 300 level, including at least one course chosen from:

MAT 332 Real Analysis
MAT 351 Modern Algebra I
MAT 358 Topology

NOTE: The Elementary Track only applies to those students who are pursuing a concurrent Major in Education with a licensure emphasis in Elementary Education (1–6). If a student withdraws from the Education Major, then the option to pursue the Elementary Track in the Mathematics Major no longer applies.

MINOR IN MATHEMATICS (6)

A minor in mathematics consists of six courses, which must include:

MAT 131–132 Elementary Calculus I and II

OR

MAT 117–118 Calculus I and II

MAT 202 Discrete Structures

The remaining three courses may be chosen from the mathematics courses numbered above 200 with at least one course numbered above 300.

TEACHER PREPARATION

Students interested in the Major in Education should consult with the Chairperson of the Mathematics Department and the Licensure Program Coordinator in the Education Department to plan a course of study. Middle school (5–8) and secondary school (8–12) teacher of mathematics programs require a Major in Mathematics. The required courses for the major and the following elective courses address the subject matter knowledge prescribed by the Massachusetts Department of Education for the field of licensure.

MAT 204 Number Theory (8–12)
MAT 208 Probability Theory (8–12)
MAT 351 Modern Algebra I (8–12)
MAT 353 Advanced Euclidean Geometry (5–8, 8–12)
ECO 115 Statistics **OR** PSY 224 Statistics (5–8, 8–12)

MAJOR IN ACTUARIAL SCIENCE (15)

The Actuarial Science major consists of a total of fifteen (15) required courses, which comprise seven specifically required courses in mathematics, six required courses in economics, and two in business studies:

REQUIRED COURSES (15)

First Year/Sophomore:

MAT 131–132 Elementary Calculus I and II

OR

MAT 117–118 Calculus I and II
MAT 231–232 Calculus III and Multivariable Calculus
MAT 202 Discrete Structures
MAT 208 Probability Theory
ECO 110–111 Microeconomics and Macroeconomics
ACC 125-126 Principles of Accounting I and II

Sophomore/Junior

MAT 207 Actuarial Mathematics
ECO 115 Statistics
ECO 215 Econometrics I
FIN 325 Managerial Finance (formerly ECO-325 Corporate Finance)
FIN 357 Investment Theory (formerly ECO-357 Investment Theory)

Senior Year

Senior Mathematics Assessment

RECOMMENDED COURSES

Students in Actuarial Science should also consider these additional courses, e.g. toward the pursuit of a minor in Finance or Economics.

MAT 203 Linear Algebra
MAT 332 Real Analysis
MAT 355 Differential Equations
CSC 113 Introduction to Computer Science
CSC 117 Introduction to Programming
CSC 120 Statistics Programming
CSC 175 Databases and Spreadsheets
CSC 261 Simulation
CSC 327 Operations Research
ECO 230 Law and Economics
ECO 310 Microeconomic Theory
ECO 311 Macroeconomic Theory
ECO 315 Econometrics II
ECO 331 Industrial Organization

Actuarial Science majors are encouraged — but not required — to take the first Actuarial Exam (Exam P, Probability, sponsored by the Society of Actuaries) soon after taking MAT 208. Exam P is a minimum requirement for entry into a summer internship or full time employment as an actuary in an insurance company program. Advanced students may also consider taking the second Actuarial Exam (Exam FM, Financial Mathematics) before graduation.

MAJOR IN DATA ANALYTICS (15)

The major consists of a total of fifteen (15) required courses, which comprise thirteen specifically required courses in computer science, mathematics and statistics; and two electives:

REQUIRED COURSES (13)

First Year/Sophomore

CSC 117 Introduction to Programming
CSC 120 Statistics Programming
CSC 233 Large Data Sets

CSC 333	Machine Learning
MAT 131–132	Honors Elementary Calculus I and II
	OR
MAT 117–118	Calculus I and II
ECO 115	Statistics
	OR
SOC 300	Statistics
	OR
PSY 224	Statistics

Sophomore/Junior

CSC 130	Data Visualization
CSC 175	Databases and Spreadsheets
	OR
CSC 321	Database Management Systems
MAT 202	Discrete Structures
MAT 203	Linear Algebra
MAT 208	Probability Theory
ECO 215	Econometrics I

ELECTIVES (2)

ACC 211	Accounting Information Systems
ACC 331	Fraud Examination
ACC 332	Forensic Accounting
BIO 260	Bioinformatics
BUS 304	Business Research
CSC 261	Simulation
CSC 327	Operations Research
ECO 216	Sports Data Analysis
ECO 315	Econometrics II
GEO/SOC 108	World Population Issues
MGT 230	Decision Analytics for Managers
MGT/MKT 302	Management Information Systems
PSY 225	Research Methods in Psychology
SOC 465	Sociological Research Methods

ALSO RECOMMENDED

CSC 301	Systems Analysis and Design
CSC 305	Data Structures
CSC 317	Java Programming
CSC 325	Artificial Intelligence
CSC/CYB 230	Computer Networks and Data Communications
PHI 260	Business Ethics
	OR
MGT 350	Professional and Ethical Responsibilities in the Sport Industry

MINOR IN DATA ANALYTICS (7)

The Data Analytics Minor consists of seven courses, which comprise five required courses, and two electives.

REQUIRED COURSES (5)

CSC 117 Introduction to Programming **OR** CSC 120 Statistics Programming (choose one)
CSC 175 Databases and Spreadsheets **OR** CSC 321 Database Management Systems (choose one)
ECO 115 Statistics **OR** SOC 300 Statistics **OR** PSY 224 Statistics (choose one)
ECO 215 Econometrics I
MAT 203 Linear Algebra

ELECTIVES (2)

ACC 211	Accounting Information Systems
ACC 331	Fraud Examination
ACC 332	Forensic Accounting
BIO 260	Bioinformatics
BUS 304	Business Research
CSC 117	Introduction to Programming
	OR
CSC 120	Statistics Programming, if not already taken for Requirement 1
CSC 130	Data Visualization
CSC 233	Large Data Sets
CSC 333	Machine Learning
CSC 261	Simulation
CSC 327	Operations Research
ECO 216	Sports Data Analysis
ECO 315	Econometrics II
GEO/SOC 108	World Population Issues
MAT 208	Probability Theory
MGT 230	Decision Analytics for Managers
MGT/MKT 302	Management Information Systems
PSY 225	Research Methods in Psychology
SOC 465	Sociological Research Methods

ALSO RECOMMENDED:

PHI 260 Business Ethics **OR** MGT 350 Professional and Ethical Responsibilities in the Sport Industry

COURSE DESCRIPTIONS

COMPUTER SCIENCE (CSC)

CSC 110 EXCEL
This course will familiarize students with selected features of the Microsoft Excel spreadsheet program. Basic skills learned can be adapted for use in courses involving business, accounting, statistics, science, math, and other areas. Applied problems from various fields will be used as examples. Prerequisite: Math placement at the level of MAT 114 or higher or completion of MAT 111. (Fall, Spring)
Staff/*One credit*

CSC 113 INTRODUCTION TO COMPUTER SCIENCE

This course presents an overview of computers and their applications. Students are exposed to a variety of platforms (e.g. MAC, PC, etc.). Topics include popular applications as well as hardware, software, the Internet, social implications and multimedia. Not open to those who have taken CSC 117. (Fall, Spring)

Staff/*Three credits*

CSC 117 INTRODUCTION TO PROGRAMMING

This course is an introduction to the field of computer science and structured programming in C++. Topics include basic computer architecture, the algorithmic approach to problem solving, various number systems, and logic. The programming language constructs introduced include types of variables, arithmetic operations, input/output, decision statements, loops, and functions. (Fall)

Staff/*Three credits*

CSC 118 INTERNET

The purpose of the course is to give a deeper understanding of what the Internet is, how it works, and how the uses of it are changing. Students will cover the history, why the technology works, the ethics in using an open system, advanced settings, what is involved in designing, creating, and maintaining a web site, and be able to discuss the problems and possible future of this topic. Our task in this class is to jointly investigate how the Internet can and is being used. We will try together to cover and understand topics that most users of the Internet are not yet using such as RSS, blogs, wikis, mashups, clouds, apps and how to better search and evaluate the materials found. My hope is that we will cover materials that you do not know even exists. (Fall)

Chase/*Three credits*

CSC 120 STATISTICS PROGRAMMING

This course introduces the Python programming language and the R programming language for statistical computing. Students will gain proficiency in writing computer programs to solve basic problems in data analysis. Applied problems will be chosen from a wide variety of subject areas. Prerequisite: Math placement at the level of MAT 114 or higher or completion of MAT 111. (Fall)

Creek/*Three credits*

CSC 130 DATA VISUALIZATION

This course introduces computer-based techniques for the visual display of quantitative information. Students will gain proficiency in the use of Excel, Tableau, and R to produce effective data visualizations and information graphics. Prerequisite: ECO 115, SOC 300 or PSY 224 Statistics. (Spring)

Staff/*Three credits*

CSC 175 DATABASES AND SPREADSHEETS

This course covers the establishment and effective use of a database using Access: design, screen forms and data-entry, queries, updating, linking related tables, report generation, and export/import to other programs. It also presents the design and application of spreadsheets using Excel: formatting, ranges, built-in functions, user-defined formulas, array formulas, table-lookups, summaries by pivot tables, graphing, linking, and macros. Some mathematical background is assumed. Prerequisite: CSC 113 or CSC 117. (Fall)

Staff/*Three credits*

CSC/CYB 230 NETWORKING AND DATA COMMUNICATIONS

This course expands upon the principles and current trends in computer networks as identified in Cybersecurity Fundamentals. Students will deepen their understanding of wide area networks (WANs), local area networks (LANs) and their architectures across which data travels and communicates. Subjects will include the open systems interconnection (OSI) model, transmissions control protocol / internet protocol (TCP/IP), open systems, topologies and internet connected devices. Through in-class projects, theoretical and practical approaches toward building and maintaining local area networks will be covered.

Prerequisites: CYB 115 or CSC 117 or CSC 120, or Instructor's permission. (Fall)

Provost/*Three credits*

CSC 231 COMPUTER ARCHITECTURE

A course introducing the student to computer architecture and assembly language programming. Topics will include memory and addressing, data representation, real and integral arithmetic, instruction formats and sets, indexing, subroutines, and error correction. Prerequisite: CSC 117 or equivalent. (Fall 2020, Fall 2022)

Staff/*Three credits*

CSC 233 LARGE DATA SETS

This course gives the student a detailed introductory experience in skills required for performing data analytics. These skills may include, but are not limited to: data extraction and import; data tidying and transformation; data visualization for exploratory analysis; constructing statistical models from the data; assessing and improving the models; and communicating the results. The programming language, e.g. R or Python, is determined by the instructor. Prerequisite: CSC 120. (Spring)

Alfano/*Three credits*

CSC/CYB 235 SECURING WIRED AND WIRELESS NETWORKS

This course provides students who have a basic understanding of computer networking and data communications with the methods and techniques used to secure networks. Students will be required to design and build a secure local area network, incorporating all elements of the seven layers of the OSI Model. Students will learn the capabilities, limitations and vulnerabilities of a cyber network that can be dynamic yet strong against aggressive hackers and virus outbreaks. Also the goal of this course is to provide students with both technical and theoretical approaches to the deployment, securing and defending of wireless networks. Topics will address network attacks, intrusion detection, malware, rogue wireless networks and wireless networking through the cloud. Students must already possess a basic knowledge of information security and networks. Team projects and presentations are required for completion. Prerequisites: CYB 115 and CSC/CYB 230, or Instructor's permission. (Spring)

Provost/Three credits

CSC 250 INTERMEDIATE PROGRAMMING

This course extends the computer science and programming concepts introduced in CSC 117. The advanced topics include: objects, pointers, arrays, records, string types, and functions with output parameters. Prerequisite: CSC 117. (Spring)

Al-Faris*/Three credits*

CSC 260 COMMAND LINE INTERFACES

This course introduces a command language computing environment, the bash shell interface to the Linux operating system. Topics covered include: an exploration of the bash shells, hierarchical file structure, file permissions, multiuser systems, utilities, shell scripts, I/O redirection, pipes, and programming in C++. Prerequisite: CSC 117. (Spring)

Staff/*Three credits*

CSC 261 SIMULATION

Exposition of basic ideas of digital computer simulation of stochastic processes, and the application of those ideas to practical problems. Prerequisite: CSC 117. (Spring 2022, Spring 2024)

Staff/*Three credits*

CSC 301 SYSTEMS ANALYSIS AND DESIGN

A course dealing with all aspects of system design and implementation. Problem definition, feasibility study, system design tools, system development control, and implementation and evaluation of systems will be covered. Prerequisite: CSC 117 or equivalent. (Fall 2021, Fall 2023)

Staff/*Three credits*

CSC 303 OPERATING SYSTEMS

This course introduces operating system design emphasizing process management for multiuser and networked systems. Topics covered include: process scheduling, interprocess communication, race conditions and solutions, memory, device and file management. Prerequisites: CSC 260 and CSC 305. (Spring 2021, Spring 2023)

Al Faris/*Three credits*

CSC 305 DATA STRUCTURES

This course introduces complex data structures such as trees, lists, stacks, and matrices. It also covers the classification of an algorithm by computing its order. The algorithms that will be analyzed include various sorting and searching methods. Prerequisite: CSC 250. (Fall)

Al-Faris/*Three credits*

CSC 315 E-COMMERCE

Learn to use the fastest-growing marketplace in the world! This course is an introduction to the world of electronic commerce, covering technical and business topics. Case studies and business examples, including triumphs and flops, are analyzed. The course considers ways that EC is affecting the business community, and the problems managers face as they adapt to doing business in cyberspace. Prerequisite: CSC 113 or CSC 117. (Spring)

Chase/*Three credits*

CSC 317 JAVA PROGRAMMING

Java is an object-oriented programming language with many interactive multimedia capabilities. This course covers the fundamentals of Java programming language, including how to write, debug, and execute Java programs. The course covers object-oriented programming techniques, as well as creating Java applets and applications. Prerequisite: CSC 305. (Spring 2021, Spring 2023)

Staff/*Three credits*

CSC 321 DATABASE MANAGEMENT SYSTEMS

This course deals with both the operational and decision support environment of database systems. Topics include indexing, randomization, physical blocking, and relational and hierarchical structures. Previous experience at the level of CSC 175 or equivalent is recommended. Prerequisite: CSC 305. (Spring 2021, Spring 2023)

Staff/*Three credits*

CSC 325 ARTIFICIAL INTELLIGENCE

This course is an open-ended discussion of what Artificial Intelligence (AI) is and how it might be achieved. Computers are defined as abstract machines. Defining intelligence is approached using results from neuroscience and cognitive psychology. Practical AI applications discussed include: language-understanding, robotics, expert systems, neural nets, and game-playing programs. Prerequisite: CSC 305 must be completed or taken concurrently. (Fall 2021)

Staff/*Three credits*

CSC 327 OPERATIONS RESEARCH

Concepts, methods, and introduction to the theory of optimization of linear systems. Topics to include simplex method, duality, sensitivity, formulation, and classic problems, e.g., maximal flow, travelling salesman, and assignment. Prerequisites: CSC 305 must be completed or taken concurrently. (Fall 2020, Fall 2022)

Staff/*Three credits*

CSC 333 MACHINE LEARNING

This course studies the construction of computer algorithms that can learn from and make predictions on data sets. Methods for supervised learning (linear regression, logistic regression, regularization, support vector machines, decision trees, naïve Bayes, linear discriminant analysis) and unsupervised learning (k-means, principal component analysis, matrix factorization, singular value decomposition). Issues of feature selection, dimensionality reduction, bias-variance tradeoff, cross-validation. Prerequisite: CSC 233. (Fall)

Alfano/*Three credits*

CYBERSECURITY (CYB)

CYB 115 CYBERSECURITY FUNDAMENTALS

This course provides a bird's eye view of the evolving cyberspace ecosystem, the interoperability of physical and social networks, and methods and techniques in securing that ecosystem. Students will explore the ethical, legal, and technical aspects of cybercrime and methods of prevention, detection, response and recovery. The value of strong moral character, integrity, and

trust as prized attributes of cybersecurity practitioners will be highlighted. Students will be introduced to essential cybersecurity topics including operating system models and mechanisms for mandatory and discretionary controls, data models, basic cryptography and its applications, security in computer networks and distributed systems, inspection and protection of information assets, detection of and reaction to threats to information assets, and examination of pre- and post-incident procedures, technical and managerial responses, an overview of the information security planning and staffing functions, data mining and data science, and policy and assurance issues. The advantages and inherent value of being prepared as a life-long learner with a strong liberal-arts background will be emphasized with the opportunity for students to complete a service-learning project tailored to their academic/career goals. No prior computer programming experience is required. Basic competency in computer operation is required. (Fall, Spring)
Albert/*Three credits*

CSC/CYB 230 NETWORKING AND DATA COMMUNICATIONS
This course expands upon the principles and current trends in computer networks as identified in Cybersecurity Fundamentals. Students will deepen their understanding of wide area networks (WANs), local area networks (LANs) and their architectures across which data travels and communicates. Subjects will include the open systems interconnection (OSI) model, transmissions control protocol / internet protocol (TCP/IP), open systems, topologies and internet connected devices. Through in-class projects, theoretical and practical approaches toward building and maintaining local area networks will be covered.
Prerequisites: CYB 115 or CSC 117 or CSC 120, or Instructor's permission. (Fall)
Provost/*Three credits*

CSC/CYB 235 SECURING WIRED AND WIRELESS NETWORKS
This course provides students who have a basic understanding of computer networking and data communications with the methods and techniques used to secure networks. Students will be required to design and build a secure local area network, incorporating all elements of the seven layers of the OSI Model. Students will learn the capabilities, limitations and vulnerabilities of a cyber network that can be dynamic yet strong against aggressive hackers and virus outbreaks. Also the goal of this course is to provide students with both technical and theoretical approaches to the deployment, securing and defending of wireless networks. Topics will address network attacks, intrusion detection, malware, rogue wireless networks and wireless networking through the cloud. Students must already possess a basic knowledge of information security and networks. Team projects and presentations are required for completion. Prerequisites: CYB 115 and CSC/CYB 230, or Instructor's permission. (Spring)
Provost/*Three credits*

CYB 265 OPERATING SYSTEMS ADMINISTRATION
Learn how best to protect computers, the data they store, process and transmit, and the users who use them, from a wide array of cybersecurity threats. This course will introduce students to operating systems administration within the context of cybersecurity. Students will learn how best to perform basic system administration operations with an emphasis on methods (e.g., managing applications, services, and network ports) to fortify the security of the computer's operating system. The class will provide coverage of methods used in the Microsoft Windows® and Linux® operating systems. Prerequisites: CYB 115, or Instructor's permission. (Fall 2020, Fall 2022)
Staff/*Three credits*

CYB 304 CRYPTOGRAPHY
Cryptography is a key component in securing data while it is stored, processed, and transmitted. Cryptography components are found in computer applications and also utilized to secure network communications. This course will introduce students to the principles of cryptography, cryptographic number theory, including hash functions, symmetric and asymmetric cryptography, and their common applications in network security and corresponding susceptibility to attacks/failures. Students will learn how best to compare, select, and apply cryptographic approaches to fortify cybersecurity. Other topics include cryptographic algorithms and programming. Prerequisites: CYB 235, or Instructor's permission. (Spring even years, starting Spring 2022)
Albert/*Three credits*

CYB 318 SOFTWARE AND APPLICATION SECURITY
Software security represents a key aspect in the field of cybersecurity. This course will ground students in the concepts of malware, malware analysis and preventive measures during software development that can mitigate malicious activity. Theoretical approaches to software security will be complemented by practical scenarios from which students can conduct future software design and investigations. Prerequisites: CYB 235, or Instructor's permission. (Fall 2021, Fall 2023)

Albert/*Three credits*

CYB 328 COMPUTER, NETWORK FORENSICS AND DIGITAL INVESTIGATIONS

This course studies the technology and practice of investigating the abuse of computing systems and digital devices. As criminal and adversarial activity becomes faster and less visible over networks, students must understand how to search for, and extract information from, cyberspace. This course will provide unparalleled insight into digital forensics methods and laws, complemented with practical lab work. This course also introduces students to the theory and practice of network traffic analysis and intrusion detection. Students will learn "traceback" techniques and information retrieval methods to identify different attacks. Topics covered will include network forensics, intrusion detection and response, case studies, and issues of cyber law and ethics. Students must have basic knowledge of networking, and operating systems. Team projects and presentations are required for completion. Prerequisites: CYB 235, or Instructor's permission. (Fall 2021, Fall 2023)
Staff/*Three credits*

CYB 338 ETHICAL HACKING

This course will introduce students to ethical hacking and penetration testing methods, learning to think like a cyber-criminal and develop secure countermeasures. Students will learn the systematic approaches to planning, reconnaissance, vulnerability identification and exploitation methods used by hackers around the world to compromise the security of existing networks, systems, and applications. A variety of penetration-testing tools and techniques will be explored through hands-on activities. Identification of corresponding cybersecurity control recommendations will be highlighted. Prerequisites: CYB 235, or Instructor's permission. (Fall 2022, Fall 2024)
Albert/*Three credits*

CYB 401 PREPARING FOR CYBER DISASTERS

This course will provide students a full picture of securing a firm from a cyberattack. Topics will include preparatory measures that continuously investigate network integrity, data security, and backup archives. Students will also develop Cyber Disaster Response Plans that consider the legal, economic, and physical requirements needed to recover from a cyberattack. Prerequisites: CYB 235, or Instructor's permission. (Spring 2022, Spring 2024)
Staff/*Three credits*

CYB 438 INDEPENDENT CYBERSECURITY PROJECT OR INTERNSHIP

Students in the Cybersecurity program will have the option during one semester to conduct and present an independent cybersecurity project or intern part time with a cybersecurity employer in the business, government or nonprofit sectors. This course is designed to provide a culminating experience that avails students the opportunity to apply what they have learned to a contemporary cybersecurity project or internship experience that is framed by current cybersecurity industry trends and concerns. The course also helps students continue to improve skills critical to success in pursuit of their future academic and career aspirations. Prerequisites: Junior or Senior standing in Cybersecurity major, or Instructor's permission. (Fall, Spring)
Albert/*Three credits*

MATHEMATICS (MAT)

MAT 111 INTRODUCTORY MATHEMATICS

An introductory course in basic algebra which covers the following topics: properties of real numbers, linear equations and inequalities, functions and graphs, polynomials, fractional algebra, radicals, and rational exponents. Not open to those who have completed any other mathematics course. (Fall, Spring)
Staff/*Three credits*

MAT 114 ELEMENTARY FUNCTIONS

A survey of those topics in algebra, trigonometry, and analytic geometry which provide the background for the study of calculus. Topics to be covered include exponential and logarithmic functions, complex numbers and polynomial functions, trigonometry, plane analytic geometry, and systems of linear equations and inequalities. Not open to those who have completed MAT 117 or 131. Prerequisite: MAT 111 or departmental permission through placement. Counts in the Core Curriculum Requirements as Mathematics Group A. If only one Mathematics course is taken to fulfill the Core requirement in Mathematics, it must be at this level or higher. (Fall, Spring)
Staff/*Three credits*

MAT 117 CALCULUS I

An introductory course in differential calculus. Topics to be covered include limits and continuity, the derivative and applications, and an introduction to integration. Not open to those who complete MAT 131. Prerequisite: MAT 114 or department permission through placement. (Fall, Spring)

Staff/*Three credits*

MAT 118 CALCULUS II

The continuation of MAT 117. Topics to be covered include the definite integral and applications, elementary techniques of integration, partial derivatives, and first-order differential equations. Not open to those who complete MAT 131 or MAT 132. Prerequisite: MAT 117. (Fall, Spring)

Kelton/*Three credits*

MAT 131 ELEMENTARY CALCULUS I (Honors)

A more rigorous introduction to calculus for entering students with good backgrounds in mathematics. Recommended for students considering a major in mathematics. Topics include the real numbers, functions, limits, the derivative and applications, the integral and applications, and techniques of integration. Not open to those who complete MAT 117 or MAT 118. Prerequisite: Departmental permission through placement. (Fall)

Andersen/*Three credits*

MAT 132 ELEMENTARY CALCULUS II (Honors)

A more rigorous introduction to calculus for entering students with good backgrounds in mathematics. Recommended for students considering a major in mathematics. Topics include the real numbers, functions, limits, the derivative and applications, the integral and applications, and techniques of integration. Not open to those who complete MAT 117 or MAT 118. Prerequisite: Departmental permission through placement. (Spring)

Andersen/*Three credits*

MAT 150 NUMBERS AND OPERATIONS FOR EDUCATORS

In this course, students will investigate fundamental mathematics concepts associated with numbers, operations, and patterns. One of the major goals of the course is for students to develop deeper conceptual understandings of the mathematics concepts they will teach in the elementary and middle grades. Not only will students gain computational proficiency but also the ability to explain to students, in multiple ways, why mathematics concepts make sense. The course heavily emphasizes the use of open-ended problem-solving methods of teaching and learning to help students develop their own functional understanding of the major concepts. A significant focus of this course will be on problem solving, reasoning and proof, multiple representations, recognizing connections (across mathematics and other disciplines), and mathematical communication. The course is intended for students planning on pursuing a career in elementary or middle school education. As such, particular attention is given to understanding common misconceptions that children have when learning about specific mathematics concepts and considering the ramifications of these misconceptions for the development of effective classroom instruction. This course is a prerequisite for EDU 324: Mathematics Teaching in the Elementary Classroom. Prerequisite: MAT 114 or higher. (Fall, Spring)

James/*Three credits*

MAT 151 ALGEBRA, GEOMETRY, AND DATA ANALYSIS FOR EDUCATORS

In this course, students will investigate fundamental mathematics concepts associated with algebra, geometry, and data analysis. One of the major goals of the course is for students to develop deeper conceptual understandings of the mathematics concepts they will teach in the elementary and middle grades. Not only will students gain computational proficiency but also the ability to explain to students, in multiple ways, why mathematics concepts make sense. The course heavily emphasizes the use of open-ended problem-solving methods of teaching and learning to help students develop their own functional understanding of the major concepts. A significant focus of this course will be on problem solving, reasoning and proof, multiple representations, recognizing connections (across content areas and disciplines), and mathematical communication. The course is intended for students planning on pursuing a career in elementary or middle school education. As such, particular attention is given to understanding common misconceptions that children have when learning about specific mathematics concepts and considering the ramifications of these misconceptions for the development of effective classroom instruction. Recommended for elementary education majors and middle/secondary mathematics education majors. Prerequisite: MAT 114 or higher. (Spring)

de la Cruz/*Three credits*

MAT 190 FACILITATING A MATHEMATICS ACADEMY I

This course is part 1 of a 2-course sequence intended to prepare students to be facilitators/leaders of the Assumption College Mathematics Academy (ACMA) in Summer 2021. Students will participate in the mathematics activities that could be used with high school students during the ACMA. Students will collaboratively develop ideas about the content of the ACMA program. This course will meet for 1-hour a week. (Fall)

Alfano/*One credit*

MAT 202 DISCRETE STRUCTURES

This course is an introduction to mathematical logic and discrete systems. Topics include Boolean algebra, mathematical proof, sets, relations, functions, induction, combinatorics, graph theory, and applications. Prerequisite: MAT 118 or MAT 132 must be completed or taken concurrently. (Fall)

Carlin/*Three credits*

MAT 203 LINEAR ALGEBRA

Linear systems of equations, matrix algebra, determinants, vector spaces, linear transformations, matrix representations of linear transformations, and applications. Prerequisite: MAT 202 or permission of instructor. (Spring)

Andersen/*Three credits*

MAT 204 NUMBER THEORY

Divisibility theory, prime factorization, congruences, Fermat's theorems, the phi-function, Euler's Theorem, and applications. Prerequisite: MAT 202. (Spring 2022, Spring 2024)

Carlin/*Three credits*

MAT 207 ACTUARIAL MATHEMATICS

Mathematical theory and practical application of compound interest, including the measurement of interest, annuity calculations, loan repayment, and security valuation. Stress laid on theoretical foundations, derivations, and proofs. Introduction to financial simulation. Prerequisite: MAT 202. (Fall 2020, Fall 2022)

Staff/*Three credits*

MAT 208 PROBABILITY THEORY

Combinatorial problems, conditional probability, dependence and independence, probability measures, distributions, and stochastic processes. Prerequisite: MAT 118 or MAT 132. (Spring)

Alfano/*Three credits*

MAT 231 CALCULUS III

A second-year course in calculus, designed to follow either MAT 118 or MAT 132. Topics to be covered include improper integrals, sequences and series, parametric curves, polar coordinates, and vector geometry. Prerequisite: MAT 118 or MAT 132. (Fall)

Kelton/*Three credits*

MAT 232 MULTIVARIABLE CALCULUS

A course in the calculus of functions of several variables. Topics to be covered include multivariable functions, partial derivatives, multiple integrals and the theorems of Green, Gauss, and Stokes. Prerequisite: MAT 231. (Spring)

Kelton/*Three credits*

MAT 332 REAL ANALYSIS

A course in classical real analysis. Topics to be covered include the real number system; convergence of sequences; limits and continuity of functions; differentiation; and integration. Prerequisite: MAT 232 or permission of instructor. (Fall 2021, Fall 2023)

Staff/*Three credits*

MAT 351 MODERN ALGEBRA I

An introductory course in abstract algebra. This course will cover the theory of groups and the definitions of rings and fields. Prerequisite: MAT 202. (Fall 2020, Fall 2022)

Kelton/*Three credits*

MAT 352 MODERN ALGEBRA II

The continuation of MAT 351. Topics include advanced group theory, and the theory of rings and fields. Prerequisite: MAT 351. (Spring 2021, Spring 2023)

Kelton/*Three credits*

MAT 353 ADVANCED EUCLIDEAN GEOMETRY

Theorems of Menelaus and Ceva. Euler line and nine-point circle. Cross-ratio, harmonic division, and orthogonality of circles. Inversive geometry. Theorems of Pappus, Desargues, and Pascal. Elementary transformations. Prerequisite: MAT 118 or MAT 132. (Fall 2021, Fall 2023)

Andersen/*Three credits*

MAT 355 DIFFERENTIAL EQUATIONS

First and second order differential equations. Linear differential equations and linear systems. Existence and uniqueness theorems. Applications. Prerequisite: MAT 232 must be completed or taken concurrently. (Spring 2021, Spring 2023)

Carlin/*Three credits*

MAT 356 NUMERICAL ANALYSIS

Roots of equations. Analysis of errors. Convergence. Interpolation and polynomial approximation. Numerical differentiation and integration. Solving linear systems, unstable matrices. The computer is used throughout the course. Prerequisite: MAT 118 or MAT 132. (Spring 2022, Spring 2024)

Alfano/*Three credits*

MAT 358 TOPOLOGY

An introductory treatment of both point-set and combinatorial topology. Topics to be covered include topological spaces and metric spaces, classification of surfaces, homology (mod 2), and map-coloring theorems. Prerequisite: MAT 202, and MAT 232 or permission of instructor. (Spring 2022, Spring 2024)

Kelton/*Three credits*

MAT 401 MATHEMATICS SEMINAR

The topic is determined by the instructor. Emphasis is placed on student oral presentations. Required course for senior mathematics majors. (Fall)

Creek/*Three credits*

MAT 402 MATHEMATICS THESIS

Available only to highly qualified students. Under the direction of an individual instructor, each student will complete a thesis (either expository or research) on some advanced topic in mathematics. (Spring)

Staff/*Three credits*

NOTE: Semesters given with a year indicate courses that are offered in alternate years.