Department of Mathematics and Computer Science

Associate Professor: Brooke M. Andersen (Chairperson); *Assistant Professors*: Joseph A. Alfano, Bang Tran; *Professors of Practice*: Raymond Albert, Suzanne L. Kozak, Selvan Snow; *Visiting Assistant Professor:* Kyle Evans; *Lecturers*: Rick Cehon, Kwabena Debrah, Jing Hu, Dana James, Robert Kumar, Raul Laborde, Annette Lemerise, Jun Thomas Ma, Karen McGrail.

COMPUTER SCIENCE MISSION STATEMENT

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. 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.

MAJOR IN COMPUTER SCIENCE (15)

REQUIRED COURSES (10)

CSC 117	Introduction to Programming (Fall)
CSC 250	Intermediate Programming (Spring)
CSC 305	Data Structures (Fall)
CSC 260	Command Line Interfaces (Spring)
MAT 117	Calculus I (Fall and Spring) **OR** MAT 131H Elementary Calculus I (Fall)
MAT 118	Calculus II (Fall and Spring) **OR** MAT 132H Elementary Calculus II (Spring)
MAT 202	Discrete Structures (Fall)
CSC/CYB 230	Networking and Data Communications (Fall)
CSC 231	Computer Architecture (Fall even numbered years)
CSC 321	Database Management Systems (Spring)

ELECTIVES (5)

Select five from among:

CSC 233	Large Data Sets (Spring)
CSC/CYB 235	Securing Wired and Wireless Networks (Spring)
CSC 261	Simulation (Spring even numbered years)
CSC 301	Systems Analysis and Design (Fall odd numbered years)
CSC 303	Operating Systems (Spring)
CSC 317	Java Programming (Spring odd numbered years)
CSC 327	Operations Research (Fall even numbered years)
CSC 333	Machine Learning (Fall)
MAT 356	Numerical Analysis (Spring even numbered years)
PHY 213	Intro to Engineering (Spring)

ADVISING TIPS FOR THE COMPUTER SCIENCE MAJOR

- Students interested in the computer science major should take CSC 117 in their first semester, because it is part of the major required sequence CSC 117, CSC 250, CSC 305.
- CSC majors are encouraged -- but not required -- to take MAT 203 Linear Algebra and MAT 208 Probability Theory.

RECOMMENDED FOUR YEAR PLAN FOR COMPUTER SCIENCE MAJOR

First Year Fall
CSC 117 Intro to Programming
MAT 117 Calculus I OR MAT 131H Honors Elementary Calculus I

First Year Spring
CSC 250 Intermediate Programming
MAT118 Calculus II OR MAT132H Elementary Calculus II

Second Year Fall
CSC 305 Data Structures
MAT 202 Discrete Structures
CSC 231 Computer Architecture (move to third year if odd year)

Second Year Spring
CSC 260 Command Line Interfaces

Third Year Fall
CSC/CYB 230 Networking and Data Communications
CSC Major Elective #1/5

Third Year Spring
CSC 321 Database Management Systems
CSC Major Elective #2/5

Fourth Year Fall
CSC Major Elective #3/5
CSC Major Elective #5/5

Fourth Year Spring
CSC Major Elective #4/5

Electives may be taken any semester.

MINOR IN COMPUTER SCIENCE (8)

REQUIRED COURSES (6)

CSC 117	Introduction to Programming (Fall)
CSC 250	Intermediate Programming (Spring)
CSC 305	Data Structures (Fall)
MAT 117	Calculus I (Fall and Spring) **OR** MAT 131H Elementary Calculus I (Fall)
MAT118	Calculus II (Fall and Spring) **OR** MAT 132H Elementary Calculus II (Spring)
MAT 202	Discrete Structures (Fall)

ELECTIVE COURSES (2)

The remaining two courses may be chosen from the computer science courses numbered above 200.

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.

MINOR IN DATA ANALYTICS (7)

REQUIRED COURSES (5)

CSC 117	Introduction to Programming (Fall) **OR** CSC 120 Statistics Programming (Fall and Spring)
CSC 175	Databases and Spreadsheets (Fall) **OR** CSC 321 Database Management Systems (Spring)
Statistics	ECO 115 Statistics with Excel (Fall and Spring) **OR** SOC 300 (Fall) **OR** PSY 224 Statistics (Fall and Spring)
ECO 215	Econometrics I (Fall)
MAT 203	Linear Algebra (Spring) Note: MAT 202 must be completed before registering

ELECTIVES (2)

ACC 211	Accounting Information Systems (Fall and Spring)

ACC 331	Fraud Examination (Fall)
ACC 332	Forensic Accounting (Spring)
BIO 260	Bioinformatics (Spring even numbered years)
BUS 304	Business Research (Spring)
CSC 117	Introduction to Programming (Fall) **OR** CSC 120 Statistics Programming (Fall and Spring), if not already taken
CSC 130	Data Visualization (Spring)
CSC 233	Large Data Sets (Spring)
CSC 333	Machine Learning (Fall)
CSC 261	Simulation (Spring even numbered years)
CSC 327	Operations Research (Fall even numbered years)
ECO 216	Sports Data Analysis (alternate years)
GEO/SOC 108	World Population Issues (alternate years)
MAT 208	Probability Theory (Spring)
MGT 230	Decision Analytics for Managers
PSY 225	Research Methods in Psychology (Fall and Spring)
SOC 465	Sociological Research Methods (Spring)

RECOMMENDED BUT NOT REQUIRED

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

CYBERSECURITY MISSION STATEMENT

The mission of the Cybersecurity degree program is to educate the next generation of cybersecurity professionals and leaders. Cybersecurity students develop a strong foundation of professional ethics, critical thinking, and interpersonal communication, as well as acquire the knowledge and technical ability to prevent, detect, respond, and recover from cybersecurity attacks. The program prepares students for employment in cybersecurity and related fields or further graduate level studies. Cybersecurity graduates recognize their responsibility to perform their jobs ethically and with integrity, thereby helping to secure, develop, and sustain the cyberspace ecosystem.

LEARNING GOALS

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;
- Use appropriate tools to prevent, detect, respond, and recover from cyberattacks.

MAJOR IN CYBERSECURITY, TRADITIONAL TRACK (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 Bachelor of Science in Cybersecurity Traditional Track 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. 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)

Statistics	ECO115 (Fall and Spring) **OR** PSY 224 (Fall and Spring) **OR** SOC 300 (Fall)
CSC 117	Introduction to Programming (Fall) **OR** CSC 120 Statistics Programming (Fall and Spring)
CYB 115	Cybersecurity Fundamentals (Fall and Spring)
CSC/CYB 230	Networking and Data Communications (Fall)
CSC/CYB 235	Securing Wired and Wireless Networks (Spring)
CYB 265	Operating Systems Administration (Fall even numbered years)
CSC 303	Operating Systems (Spring odd numbered years)
CSC 321	Database Management Systems (Spring)
CYB 304	Cryptography (Spring even numbered years)
CYB 318	Software and Application Security (Fall)
CYB 328	Computer, Network Forensics and Digital Investigations (Fall)
CYB 338	Ethical Hacking (Fall)
CYB 401	Preparing for Cyber Disasters (Spring even numbered years)
CYB 438	Independent Cybersecurity Project or Internship (Fall and Spring)

ADVISING TIPS FOR THE MAJOR IN CYBERSECURITY, TRADITIONAL TRACK

- Students interested in the Cybersecurity major should take CYB 115 in their first year at Assumption because it is part of the major required sequence CYB 115, 230, 235.

RECOMMENDED FOUR YEAR PLAN FOR MAJOR IN CYBERSECURITY, TRADITIONAL TRACK

First Year Fall
CYB 115 Cybersecurity Fundamentals
CSC 117 Intro to Programming or CSC 120 Statistics Programming

First Year Spring
Statistics (ECO 115, PSY 224, **OR** SOC 300)

Second Year Fall
CSC/CYB 230 Networking and Data Communications
CYB 265 Operating Systems Admin. (move to 3rd year if odd year)

Second Year Spring
CSC/CYB 235 Securing Wired and Wireless Networks
CSC 303 Operating Systems (move to 3rd year if odd year)
CSC 321 Database Management Systems

Third Year Fall
CYB 318 Software and Application Security
CYB 328 Computer, Network Forensics and Digital Investigations

Third Year Spring
CYB 304 Cryptography (move to 4th year if odd year)
CYB 401 Preparing for Cyber Disasters
(move to 4th year if odd year)

Fourth Year Fall
CYB 338 Ethical Hacking

Fourth Year Spring
CYB 438 Independent Cybersecurity Project

MINOR IN CYBERSECURITY (6)

A Cybersecurity minor provides a natural complement of professional skills for students who are pursuing certain non-Cybersecurity majors, especially in Business and Criminology. At least one program of study, the Minor in Fraud Examination and Forensic Accounting, already requires a cybersecurity course.

REQUIRED COURSES (4)

CYB 115	Cybersecurity Fundamentals (Fall and Spring)
CSC/CYB 230	Networking and Data Communications (Fall)
CSC/CYB 235	Securing Wired and Wireless Networks (Spring)
CYB 265	Operating Systems Administration (Fall even numbered years)

ELECTIVES (2)

CSC 303	Operating Systems (Spring odd numbered years)
CYB 304	Cryptography (Spring even numbered years)
CYB 318	Software and Application Security (Fall)
CSC 321	Database Management Systems (Spring)
CYB 328	Computer, Network Forensics and Digital Investigations (Fall)
CYB 338	Ethical Hacking (Fall)
CYB 401	Preparing for Cyber Disasters (Spring even numbered year)
CYB 438	Independent Cybersecurity Project or Internship (Fall and Spring)

MAJOR IN CYBERSECURITY: POST-BACHELOR'S ACCELERATED TRACK

The Post-Bachelor's Accelerated Cybersecurity Track utilizes an innovative online delivery modality – allowing flexibility for adult learners who have already earned a bachelor's degree from an accredited institution of higher education. All courses are delivered online with an appropriate balance of synchronous and asynchronous elements. Assumption University is an ideal place to learn - offering small cohort sizes and competitive pricing. Graduates will be prepared for rewarding careers in as few as 14 months. To graduate with a Bachelor of Science in Cybersecurity degree in the post-bachelor's accelerated track, the student must fulfill all the Cybersecurity major requirements, excluding the prerequisite Statistics course, and attain a Grade Point Average (GPA) of at least 2.0 both cumulatively and in the major program of study.

REQUIRED COURSES (13)

CSC 117A	Introduction to Programming **OR** CSC 120A Statistics Programming (Spring, Summer Session II)
CYB 115A	Cybersecurity Fundamentals (Spring, Summer Session I, Fall)
CSC/CYB 230A	Networking and Data Communications (Summer Session I, Summer Session II, Spring)
CSC/CYB 235A	Securing Wired and Wireless Networks (Summer Session II, Fall, Summer Session I)
CYB 265A	Operating Systems Administration (Summer Session II)
CSC 303A	Operating Systems (Fall)
CSC 321A	Database Management Systems (Fall)
CYB 304A	Cryptography (Summer Session II)
CYB 318A	Software and Application Security (Fall)
CYB 328A	Computer, Network Forensics and Digital Investigations (Fall)
CYB 338A	Ethical Hacking (Spring)
CYB 401A	Preparing for Cyber Disasters (Summer Session II)
CYB 438A	Independent Cybersecurity Project or Internship (Spring)

RECOMMENDED PLAN FOR MAJOR IN CYBERSECURITY, ACCELERATED TRACK

Spring – Term I	Summer Session I – Term 2
CSC 117A Introduction to Programming or CSC 120A Statistics Programming CYB 115A Cybersecurity Fundamentals	CSC/CYB 230A Networking and Data Communications
Summer Session II – Term 3	**Fall – Term 4**
CSC/CYB 235A Securing Wired and Wireless Networks CYB 265A Operating Systems Administration CYB 304A Cryptography CYB 401A Preparing for Cyber Disasters	CSC 303A Operating Systems CSC 321A Database Management Systems CYB 318A Software and Application Security CYB 328A Computer, Network Forensics and Digital Investigations
Spring, Term 5	
CYB 338A Ethical Hacking CYB 438A Independent Cybersecurity Project or Internship	

APPLICATION TO THE POST-BACHELOR'S ACCELERATED CYBERSECURITY TRACK

The Post-Bachelor's Accelerated Cybersecurity Track is for those individuals who already have a bachelor's degree from an accredited institute of higher education. The program admits students at the start of the Spring, Summer Session I, and Fall semesters commencing with the Spring 2025 term. Applicants to the program should have a good understanding of technology and how it works and must meet or exceed the following minimum criteria:

1. An earned bachelor's degree from an accredited institute of higher education with a cumulative GPA of 3.0;
2. Completion of Statistics with a minimum final grade of C+ and taken within the last ten years.

MATHEMATICS MISSION STATEMENT

The Mathematics program provides a supportive and stimulating learning environment to all students interested in the pursuit of truth through mathematics and its applications. As mathematics is a founding discipline of the liberal arts, we support the mission of the University in the Catholic liberal arts tradition, forming students intellectually, through our course offerings in the Foundations Program. 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 strengthen their problem-solving skills, their reasoning and communication abilities, and their knowledge of the various fields of mathematics. The major provides a foundation for meaningful professional careers (including actuarial and engineering sciences, teaching, and business) and for graduate study in a variety of fields.

LEARNING GOALS

Mathematics program graduates will be able to

- Communicate mathematical ideas and present mathematical arguments both in writing and orally using proper use of mathematical notation and terminology;
- Demonstrate problem-solving proficiency across a wide variety of mathematical and real-world problems;
- Write, understand and critique mathematical proofs utilizing correct mathematical terminology and rules of logic;
- Know and apply the fundamental principles underlying the major areas of mathematics.

MAJOR IN MATHEMATICS (12)

- Students interested in the mathematics major should follow their math placement and take Calculus I as early as possible, because it is part of the major required sequence MAT 117/MAT 131H, 118/132H, 231,232.
- Students considering a major in mathematics are encouraged to take MAT 131H/132H rather than MAT 117/118 in their first year.
- Mathematics majors must pass a comprehensive examination administered during the senior year. The exam is based on material covered in the required courses.

REQUIRED COURSES (8)

MAT 117	Calculus I (Fall and Spring) **OR** MAT131H Honors Calculus I (Fall)
MAT 118	Calculus II (Fall and Spring) **OR** MAT132H Honors Calculus II (Spring)
CSC 117	Introduction to Programming (Fall) **OR** CSC 120 Statistics Programming (Fall and Spring)
MAT 231	Calculus III (Fall)
MAT 232	Multivariable Calculus (Spring)
MAT 202	Discrete Structures (Fall)
MAT 203	Linear Algebra (Spring)
MAT 401	Mathematics Seminar (Fall)

Senior Mathematics Assessment (Comprehensive Exam, not a course - Fall and Spring)

ELECTIVES (4)

Take at least one of:

MAT 332	Real Analysis (Fall odd numbered years)
MAT 351	Modern Algebra (Fall even numbered years)
MAT 358	Topology (Spring even numbered years)

Take at least one of:

MAT 352	Modern Algebra II (Spring odd numbered years)
MAT 353	Adv. Euclidean Geometry (Fall odd numbered years)
MAT 355	Differential Equations (Spring odd numbered years)
MAT 356	Numerical Analysis (Spring even numbered years)
MAT 402	Mathematics Thesis (Fall and Spring)

Take at least two more 200+ level Math courses from above, or:

MAT 204	Number Theory (Spring even numbered years)
MAT 207	Actuarial Mathematics (Fall even numbered years)
MAT 208	Probability Theory (Spring)
PHY 213	Intro to Engineering (Spring)

RECOMMENDED FOUR YEAR PLAN FOR MATHEMATICS MAJOR

First Year Fall
MAT 117 Calculus I **OR** MAT131H Honors Calculus I
CSC 117 Intro. Programming **OR** CSC 120 Stats Programming

First Year Spring
MAT 118 Calculus II **OR** MAT 132H Honors Calculus II

Second Year Fall
MAT 202 Discrete Structures
MAT 231 Calculus III

Second Year Spring
MAT 203 Linear Algebra
MAT 232 Multivariable Calculus

Third Year Fall
Math Major Elective #1/4

Third Year Spring
Math Major Elective #2/4

Fourth Year Fall
Math Major Elective #3/4

Fourth Year Spring
Math Major Elective #4/4

MAT 401 Mathematics Seminar Senior Math Assessment Exam; not a course

MINOR IN MATHEMATICS (6)

REQUIRED COURSES (3)

MAT 117 Calculus I (Fall and Spring) **OR** MAT 131H Honors Calculus I (Fall)
MAT 118 Calculus II (Fall and Spring) **OR** MAT 132H Honors Calculus II (Spring)
MAT 202 Discrete Structures

ELECTIVES (3)

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

MAJOR IN MATHEMATICS, ELEMENTARY EDUCATION TRACK (10)

The Elementary Track applies only to those students who are pursuing a concurrent major in Elementary Education. If a student withdraws from the Education major, the option to pursue the Elementary Track in the Mathematics Major no longer applies and the 12-course major would be required. Mathematics majors who are pursuing licensure in Middle/Secondary Education (5–8; 8–12) complete the standard 12 courses required in the Mathematics major.

REQUIRED COURSES (6)

MAT 117 Calculus I (Fall and Spring) **OR** MAT 131H Honors Calculus I (Fall)
MAT 118 Calculus II (Fall and Spring) **OR** MAT 132H Honors Calculus II (Spring)
MAT 150 Numbers and Operations for Educators (Fall and Spring)
MAT 231 Calculus III (Fall)
MAT 202 Discrete Structures (Fall)
MAT 203 Linear Algebra (Spring)
Senior Mathematics Assessment (Comprehensive Exam, not a course - Fall and Spring)

ELECTIVES (4)

Take at least one of:

MAT 332 Real Analysis (Fall odd numbered years)
MAT 351 Modern Algebra (Fall even numbered years)
MAT 358 Topology (Spring even numbered years)

Take at least one of:

MAT 352 Modern Algebra II (Spring odd numbered years)
MAT 353 Adv. Euclidean Geometry (Fall odd numbered years)
MAT 355 Differential Equations (Spring odd numbered years)
MAT 356 Numerical Analysis (Spring even numbered years)
MAT 402 Mathematics Thesis (Fall and Spring)

Take at least two more 200+ level Math courses from above, or:

MAT 204 Number Theory (Spring even numbered years)
MAT 207 Actuarial Mathematics (Fall even numbered years)
MAT 208 Probability Theory (Spring) Recommended for Elementary Education majors
PHY 213 Intro to Engineering (Spring)

ADVISING TIPS FOR MAJOR IN MATHEMATICS ELEMENTARY EDUCATION TRACK

- Students interested in the mathematics major should follow their math placement and take Calculus I as early as possible, because it is part of the required sequence MAT 117/MAT 131H, 118/MAT 132H, 231, 232.

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

SUGGESTED FOUR YEAR PLAN FOR MATHEMATICS MAJOR, ELEMENTARY EDUCATION TRACK

First Year Fall
MAT 117 Calculus I **OR** MAT131H Honors Calculus I

First Year Spring
MAT 118 Calculus II **OR** MAT132H Honors Calculus II

Second Year Fall
MAT 202 Discrete Structures
MAT 231 Calculus III

Second Year Spring
MAT 203 Linear Algebra
MAT 150 Numbers and Operations for Educators

Third Year Fall
Math Major Elective #1/4

Third Year Spring
Math Major Elective #2/4
Math Major Elective #3/4

Fourth Year Fall
Math Major Elective #4/4
Senior Math Assessment Exam; not a course.

Fourth Year Spring

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 with Excel **OR** PSY 224 Statistics (5–8, 8–12)

ACTUARIAL SCIENCE

Students interested in becoming an Actuary after graduation should major in Mathematics and take the following electives to prepare for the Actuary Exam:

MAT 207 Actuarial Mathematics
MAT 208 Probability Theory, followed by Exam P
MAT 332 Real Analysis
MAT 355 Differential Equations

Students may be interested in completing a minor in Finance and Data Analytics in addition to the math major to better prepare for their future career. There are many overlapping courses between the major and these minors. Mathematics majors with interest in Actuarial Science are encouraged – but not required – to take the first Actuarial Exam (Exam P, Probability, sponsored by 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. More information about the Actuarial Exam is available at the Society of Actuaries web site: https://www.soa.org Professor Joe Alfano conducts review sessions for students interested in taking the Actuary Exam. Contact him, jalfano@assumption.edu.

3:2 ENGINEERING PROGRAMS WITH UNIVERSITY OF NOTRE DAME AND WASHINGTON UNIVERSITY IN ST. LOUIS

Students interested in pursuing one of the 3:2 engineering programs should take the technical courses listed below in their first year at Assumption. Careful planning is important to meet the prerequisites for admission to Notre Dame or Washington University. Interested students should meet with the dual degree engineering program director, Professor Theresa Herd, to start planning their curriculum.

AU Major	UND/WUSTL Engineering Major	Recommended first-year courses at Assumption	
		Fall	Spring
Biology	Biomedical	MAT 117 OR MAT 131H Calculus I CHE 131 Chemistry I BIO 160 Concepts in Biology	MAT 118 OR MAT 132H Calculus II CHE 132 Chemistry II BIO 210 Genetics PHY 213 Introduction to Engineering Problem Solving
Chemistry	Chemical	MAT 117 OR MAT 131H Calculus I CHE 131 Chemistry I BIO 160 Concepts in Biology	MAT 118 OR MAT 132H Calculus II CHE 132 Chemistry II PHY 213 Introduction to Engineering Problem Solving
Environmental Science	Environmental	MAT 117 OR MAT131H Calculus I CHE 131 Chemistry I ENV 150 Introduction to Environmental Science	MAT 118 OR MAT132H Calculus II CHE 132 Chemistry II PHY 213 Introduction to Engineering Problem Solving BIO 160 Concepts in Biology
Math	Aerospace Civil Electrical Mechanical	MAT 117 OR MAT 131H Calculus I PHY 201H Physics I CSC 120 Statistics Programming in Python	MAT 118 OR MAT 132H Calculus II PHY 202H Physics II PHY 213 Introduction to Engineering Problem Solving
	Data Science	MAT 117 OR MAT131H Calculus I PHY 201H Physics I CSC 120 Statistics Programming in Python	MAT 118 OR MAT132H Calculus II PHY 202H Physics II PHY 213 Introduction to Engineering Problem Solving CSC 233 Large Data Sets
	Systems	MAT 117 OR MAT131H Calculus I PHY 201H Physics I CSC 117 Introduction to Programming in C++	MAT 118 OR MAT132H Calculus II PHY 202H Physics II PHY 213 Introduction to Engineering Problem Solving CSC 250 Intermediate Programming
Computer Science	Computer	MAT 117 OR MAT131H Calculus I PHY 201H Physics I CSC 117 Introduction to Programming in C++	MAT 118 OR MAT132H Calculus II PHY 202H Physics II PHY 213 Introduction to Engineering Problem Solving CSC 250 Intermediate Programming

COURSE DESCRIPTIONS

COMPUTER SCIENCE (CSC)

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. (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)

Warren/*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, Spring)

Staff/*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. (Fall)

Staff/*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 CSC 120 or equivalent. (Fall even numbered years)

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 117 or CSC 120. (Spring)
Staff/*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. (Spring)
Staff/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)
Staff/*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 such as inventory, queueing, shipping and manufacturing. Prerequisite: CSC 117. (Spring even numbered years)
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 odd numbered years)
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 117 or CSC 120. (Spring)
Staff/*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)
Staff/*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 even numbered years)

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 117 or CSC 120. (Spring)

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 even numbered years)

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)

Staff/*Three credits*

CYBERSECURITY, TRADITIONAL TRACK (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)

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. (Fall)

Staff/*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. (Spring)

Staff/*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. (Fall even numbered years)

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 (can be taken concurrently). (Spring even numbered years)

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. (Fall)

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. (Fall)

Albert/*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. (Fall)

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: Prerequisites: CYB 235 (can be taken concurrently). (Spring even numbered years)
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. (Spring)
Albert/*Three credits*

CYBERSECURITY, ACCELERATED TRACK (CYB/A)

CSC 117A 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. (Spring, Summer Session II)
Staff/*Three credits*

CSC 120A 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. (Spring, Summer Session II)
Staff/*Three credits*

CYB 115A 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. (Spring, Summer Session I, Fall)
Staff/*Three credits*

CSC/CYB 230A 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 115A or CSC 117A or CSC 120A. (Summer Session I, Summer Session II, Spring)
Staff/*Three credits*

CSC/CYB 235A 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 115A and CSC/CYB 230A. (Summer Session II, Fall, Summer Session I)
Staff/*Three credits*

CYB 265A 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 115A. (Summer Session II)
Staff/*Three credits*

CSC 303A 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 117A or CSC 120A. (Fall)
Staff/*Three credits*

CSC 321A 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 117A or CSC 120A. (Fall)
Staff/*Three credits*

CYB 304A 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 235A (can be taken concurrently). (Summer Session II)
Staff/*Three credits*

CYB 318A 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 235A. (Fall)
Staff/*Three credits*

CYB 328A 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 235A. (Fall)

Staff/*Three credits*

CYB 338A 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 235A. (Spring)

Staff/*Three credits*

CYB 401A 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: Prerequisites: CYB 235A (can be taken concurrently). (Summer Session II)

Staff/*Three credits*

CYB 438A 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: Half or more of Cybersecurity major course requirements completed. (Spring)

Staff/*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)

Kozak/*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. Fulfills a requirement in the Foundations Program. If only one Mathematics course is taken to fulfill the Foundations Program 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. Not open to those who complete MAT 131 or MAT 132. Prerequisite: MAT 117. (Fall, Spring)

Staff/*Three credits*

MAT 131H 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. Not open to those who complete MAT 117 or MAT 118. Prerequisite: Departmental permission through placement. (Fall)

Staff/*Three credits*

MAT 132H 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 integral and applications, and techniques of integration. Not open to those who complete MAT 117 or MAT 118. Prerequisite: Departmental permission through placement. (Spring)

Staff/*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)

De La Cruz/*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 L Cruz/*Three credits*

MAT 190 FACILITATING A MATH ACADEMY I

This course is part of a 2-course sequence intended to prepare students to be facilitators/leaders of the Assumption Institute of Mathematics (Camp AIM) in Summer 2025. Students will learn about basic teaching best practices to engage and motivate high

school students, receive an introduction to examples of mathematics activities that could be used with high school students during Camp AIM, and develop ideas about the content of the Camp AIM program. This course will meet for one hour per week. The companion spring course is EDU 190 Facilitating a Math Academy II.
Staff/ *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)
Staff/*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. (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 even numbered years)
Staff/*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 even numbered years)
Alfano/*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)
Andersen/*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)
Andersen/*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 202, and MAT 231 or permission of instructor. (Fall odd numbered years)
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 even numbered years)
Andersen/*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 odd numbered years)

Andersen/*Three credits*

MAT 353 ADVANCED EUCLIDEAN GEOMETRY

An axiomatic approach to geometry built on Euclid's work with an emphasis on theorems and proofs. Topics include congruence, constructions, area, angle measure, similar figures, circle measure, and perspective geometry. Prerequisite: MAT 202. (Fall odd numbered years)

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 231 must be completed or taken concurrently. (Spring odd numbered years)

Alfano/*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 even numbered years)

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 231 or permission of instructor. (Spring even numbered years)

Staff/*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)

Alfano/*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*