CRYPTOGRAPHY, EMPHASIS

The Area of Emphasis (AoE) in cryptography offers a robust response to current and future workforce needs while allowing students to explore the practical and theoretical dimensions of secure communications. The emphasis provides a unique interdisciplinary experience that combines mathematics and computer science, equipping students with the skills needed for critical roles in data security, research, and innovation.

The AoE helps focus student efforts toward individual goals and interests with consideration to obtaining rewarding careers in the fields of mathematics, statistics, data science, and cyber security or pursuing advanced studies. With an increasing demand for cybersecurity experts, the emphasis in cryptography enhances student marketability and equips students with the skills necessary to enter the high-demand job market. It addresses cybersecurity challenges and a growing global need for experts in security systems.

Cryptography is fundamental to securing digital communications, data privacy, and national security. With the exponential growth of digital systems, e-commerce, and global internet usage, the need for skilled cryptographers has surged. The rise of technologies like quantum computing poses new challenges to existing cryptographic methods. Post-quantum cryptography and advancements in encryption techniques are areas of active research and innovation, making this an evolving field with exciting opportunities. By developing cryptographic expertise, students are positioned to work in diverse industries such as banking, software development, government intelligence, telecommunications, and emerging tech sectors like blockchain.

Moreover, the program also supports institutional goals of providing cutting-edge education that is responsive to societal and technological changes. Students majoring in the emphasis can easily earn minors in Computer Science, and Computer & Information Security.

Course Requirements

- General Education Course

- Milestone course: a key success marker for your major. See your advisor to discuss the importance of this course in your plan of study.

The Core Curriculum is designed to foster critical thinking skills and introduce students to basic domains of thinking that transcend disciplines. The Core applies to all majors. Information on specific classes in the Core can be found at https://www.marshall.edu/gened/.

Code	Title	Credit Hours
Core Curriculum		
Core 1: Critical Thinking		
FYS 100	First Yr Sem Critical Thinking	3
MTH 229	Calculus/Analytic Geom I (CT)	5
Critical Thinking Course		3
Core 2		
ENG 101	Beginning Composition	3
ENG 201	Advanced Composition	3
CMM 103	Fund Speech-Communication	3
or CMM 207	Business Communication	
MTH 229	Calculus/Analytic Geom I (CT)	5
Core 2 Natural/Physical Science		3
Core 2 Humanities		3
Core 2 Social Science		3
Core 2 Fine Arts		3
Additional Univeristy Requirements		
Writing Intensive		3
Writing Intensive		3
Multicultural or International		3
MTH 490	Internship in Mathematics	2-12
or MTH 491	Senior Seminar	
College-Specific		
MTH 229	Calculus/Analytic Geom I (CT)	5
COS Physical/Natural Science		4
COS Phsical/Natural Science		3
Major-Specific		
CS 110	Computer Science I	3
MTH 229	Calculus/Analytic Geom I (CT)	5
MTH 230	Calculus/Analytic Geom II	4
MTH 231	Calculus/Analytic Geom III	4
MTH 300	Intro to Higher Math	4
MTH 331	Linear Algebra	4
MTH 335	Ordinary Diff Equations	3
MTH 427	Advanced Calculus I	3
MTH 428	Advanced Calculus II	3
MTH 443	Numerical Analysis	3
STA 445	Probability & Statistics I	3
MTH 450	Modern Algebra I	3
MTH 452	Modern Algebra II	3
MTH 490	Internship in Mathematics	2-12
or MTH 491	Senior Seminar	
Area of Emphasis - Specific		
MTH 440	Graph Th and Combinatorics	3
MTH 455	Number Theory and Cryptography	3
MTH 456	Mathematical Cryptography	3
STA 435	Statistical Data Mining	3
CS 120	Computer Science II	3
CS 210	Data Structures and Algorithms	3
CS 320	Internetworking	3
CS 430	Cyber Security	3
or CYBR 330	Cyber Security	
CS 435	Cyber Risk	3
or CYBR 435	Cyber Risk	
Area of Emphasis Electives (Choose any one from the following)		*3*
MTH 411	Mathematical Modeling	
MTH 442	Numerical Linear Algebra	
MTH 415	Partial Differential Equations	
MTH 416	Advanced Differential Equation	

MTH 431	Topology II	
STA 412	Regression Analysis	
STA 420	Nonparametric Statistics	
STA 422	Time Series Forecasting	
STA 446	Probability & Statistics II	
STA 464	Statistical Computing	
STA 466	Stochastic Processes	
STA 470	Applied Survival Analysis	

Semester Plan

- General Education Course

- Milestone course: a key success marker for your major. See your advisor to discuss the importance of this course in your plan of study.

First Year

First Semester		**Credit Hours**
FYS 100	First Yr Sem Critical Thinking	3
ENG 101	Beginning Composition	3
CS 110	Computer Science I	3
MTH 229	Calculus/Analytic Geom I (CT)	5
UNI 100	Freshman First Class	1
	Credit Hours	**15**
Second Semester		
CMM 103 or CMM 207	Fund Speech-Communication or Business Communication	3
CS 120	Computer Science II	3
MTH 230	Calculus/Analytic Geom II	4
Core 2 Humanities		3
Core 2 Social Science		3
	Credit Hours	**16**

Second Year

First Semester		
CS 210	Data Structures and Algorithms	3
MTH 231	Calculus/Analytic Geom III	4
MTH 300	Intro to Higher Math	4
Core 2 Natural / Physical Science		4
	Credit Hours	**15**
Second Semester		
ENG 201	Advanced Composition	3
MTH 331	Linear Algebra	4
MTH 335	Ordinary Diff Equations	3
COS Physical/Natural Science		4
Writing Intensive		3
	Credit Hours	**17**

Third Year

First Semester		
MTH 427	Advanced Calculus I	3
MTH 455	Number Theory and Cryptography	3
MTH 450	Modern Algebra I	3
STA 445	Probability & Statistics I	3
COS Physical/Natural Science		3
	Credit Hours	**15**
Second Semester		
CS 320	Internetworking	3
MTH 428	Advanced Calculus II	3
MTH 452	Modern Algebra II	3
MTH 456	Mathematical Cryptography	3
Critical Thinking Course		3
	Credit Hours	**15**

Fourth Year

First Semester		
CS 430 or CYBR 330	Cyber Security or Cyber Security	3
MTH 443	Numerical Analysis	3
STA 435	Statistical Data Mining	3
Core 2 Fine Arts		3
Writing Intensive		3
	Credit Hours	**15**
Second Semester		
CS 435 or CYBR 435	Cyber Risk or Cyber Risk	3
MTH 440	Graph Th and Combinatorics	3
MTH 491 or MTH 490	Senior Seminar or Internship in Mathematics	2-12
Multicultural or International		3
Area of Emphasis Elective		3
	Credit Hours	**14-24**
	Total Credit Hours	**122-132**