

College of Science
Bachelor of Science in Computational Modeling and Data Analytics
Major in Computational Modeling and Data Analytics (CMDA)
Option: Cryptography and Cybersecurity

For students entering under UG catalog 2023–2024

CORE REQUIREMENTS (18 credits)		
<i>Complete all following courses in CMDA and Mathematics. Courses marked with * will be used for computing the “in major” GPA.</i>		
CMDA 3605 *	Mathematical Modeling: Methods and Tools <i>(Pre: (CS 1114 or CS 1064 or MATH 3054), (MATH 2114 or MATH 2114H or MATH 2405H), (MATH 2204 or MATH 2204H or MATH 2406H or CMDA 2006), (MATH 2214 or MATH 2214H or MATH 2406H or CMDA 2006))</i>	(3)()
CMDA 3606 *	Mathematical Modeling: Methods and Tools <i>(Pre: CMDA 3605)</i>	(3)()
CMDA/CS 3634 *	Computer Science Foundations for Computational Modeling & Data Analytics <i>(Pre: CS 2114)</i>	(3)()
CMDA/CS/STAT 3654 *	Introductory Data Analytics & Visualization <i>(Pre: (CS 1114 or CS 1044 or CS 1054 or CS 1064), (MATH 2224 or MATH 2224H or MATH 2204 or MATH 2204H or MATH 2406H or CMDA 2005), (STAT 3006 or STAT 4105 or STAT 4705 or STAT 4714 or CMDA 2006))</i>	(3)()
CMDA/CS/STAT 4654 *	Intermediate Data Analytics and Machine Learning <i>(Pre: (STAT 3654 or CS 3654 or CMDA 3654), (STAT 3104 or STAT 4106 or STAT 4706 or CMDA 2006))</i>	(3)()
MATH 2114 *	Introduction to Linear Algebra <i>(Pre: MATH 1225 or MATH 1226)</i>	(3)()

MAJOR REQUIREMENTS (24 credits)		
<i>Complete all following courses in CMDA, Computer Science, and Mathematics. Courses marked with * will be used for computing the “in major” GPA. # Any approved First Year Experience (FYE) Course at Virginia Tech will satisfy this requirement. † MATH 2204*, MATH 2214*, STAT 3005*, STAT 3006* & STAT 3104* substitute for CMDA 2005 & CMDA 2006. ‡ CS 1114* will substitute for CS 1064 and CS 2064.</i>		
CMDA 1634 **	Discovering Computational Modeling and Data Analytics	(3)()
CMDA 2005 *†	Integrated Quantitative Sciences <i>(Pre: MATH 1226, Co: MATH 2114)</i>	(6)()
CMDA 2006 *†	Integrated Quantitative Sciences <i>(Pre: CMDA 2005, (MATH 2114 or MATH 2114H))</i>	(6)()
CS 1064 *‡	Introduction to Programming in Python	(3)()
CS 2064 *‡	Intermediate Programming in Python <i>(Pre: CS 1064)</i>	(3)()
CS 2114 *	Software Design and Data Structures <i>(Pre: CS 1114 or CS 2064)</i>	(3)()

<p>CRYPTOGRAPHY AND CYBERSECURITY REQUIREMENTS (18 credits) <i>Complete all following courses.</i> <i>These courses, all marked with *, will be used for computing the "in major" GPA.</i></p>

BIT/CS/PSCI 2164 *	Foundations of Contemporary Security Environments	(3)()
BIT/CS/PSCI 4164 *	Future of Security: Integrative Solutions for Complex Security Systems <i>(Pre: PSCI 2164 or CS 2164 or BIT 2164)</i>	(3)()
CS 2505 *	Introduction to Computer Organization <i>(Pre: CS 2114; Co: (MATH 2534 or MATH 3034))</i>	(3)()
MATH 2534 *	Introduction to Discrete Mathematics <i>(Pre: CS 1114 or ECE 1574 or ECE 1004)</i>	(3)()
MATH 4175 *	Cryptography <i>(Pre: MATH 3034 or MATH 3124 or MATH 3134 or MATH 3144 or MATH 3224 or MATH 4134 or CMDA 3605)</i>	(3)()
MATH 4176 *	Cryptography <i>(Pre: MATH 4175 or CMDA 3606 or (MATH 3034, MATH 3124) or (MATH 3034, MATH 3134) or (MATH 3034, MATH 3144) or (MATH 3034, MATH 3224) or (MATH 3034, MATH 4134) or (MATH 3124, MATH 3134) or (MATH 3124, MATH 3144) or (MATH 3124, MATH 3224) or (MATH 3124, MATH 4134) or (MATH 3134, MATH 3144) or (MATH 3134, MATH 3224) or (MATH 3134, MATH 4134) or (MATH 3144, MATH 3224) or (MATH 3144, MATH 4134) or (MATH 3224, MATH 4134)</i>	(3)()

<p>SOFTWARE DEVELOPMENT REQUIREMENTS (3 credits) <i>Complete one course from the following list.</i> <i>These courses, all marked with *, will be used for computing the "in major" GPA.</i></p>

CS 3714 *	Mobile Software Development <i>(Pre: CS 2114)</i>	(3)()
CS 3754 *	Cloud Software Development <i>(Pre: CS 2114)</i>	(3)()

<p>RESTRICTED ELECTIVES FOR CRYPTOGRAPHY AND CYBERSECURITY OPTION (6 credits) <i>Complete two courses from the following list.</i> <i>These courses, marked with *, will be used for computing the "in major" GPA.</i></p>

BIT 4624 *	Cybersecurity Analytics for Business <i>(Pre: BIT 4614 or CS 4264)</i>	(3)()
CMDA 4634 *	Scalable Computing for Computational Modeling and Data Analytics <i>(Pre: (CMDA 3634 or CS 3634 or CS 4234), (CMDA 3654 or CS 3654 or STAT 3654), (CMDA 3605 or CS 3414 or MATH 3414 or MATH 4445)</i>	(3)()
CS 4264 *	Principles of Computer Security <i>(Pre: CS 3214 or (ECE 2500, ECE 3574))</i>	(3)()
FIN 4014 *	Cyberlaw and Policy	(3)()
MATH 3124 *	Modern Algebra <i>(Pre: MATH 3034)</i>	(3)()
MATH 3134 *	Applied Combinatorics and Graph Theory <i>(Pre: MATH 1226, (MATH 2534 or MATH 3034)</i>	(3)()
PHYS 4254 *	Quantum Information Technologies <i>(Pre: PHYS 2306, (MATH 2114 or MATH 2114H))</i>	(3)()

REQUIREMENTS FOR THE COLLEGE AND UNIVERSITY PATHWAYS GENERAL EDUCATION (47 credits)
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Concept 1f: Foundational Discourse

_____ (3) () _____ (3) ()

Concept 1a: Advanced/Applied Discourse

_____ (3) ()

Concept 2: Critical Thinking in the Humanities

_____ (3) () _____ (3) ()

Concept 3: Reasoning in the Social Sciences

_____ (3) () _____ (3) ()

Concept 4: Reasoning in the Natural Sciences

_____ (3) () _____ (3) ()

Concept 5f: Foundational Quantitative and Computational Thinking

MATH 1225 Calculus of a Single Variable (4) ()

MATH 1226 Calculus of a Single Variable (*Pre: MATH 1225*) (4) ()

Concept 5a: Advanced/Applied Quantitative and Computational Thinking

CMDA 4864 * CMDA Capstone (3) ()

(*Pre: CMDA 3605, (CMDA 3634 or CS 3634), (CMDA 3654 or CS 3654 or STAT 3654)*)

Concept 6a: Critique and Practice in the Arts

_____ (3) ()

Concept 6d: Critique and Practice in Design

_____ (3) ()

Concept 7: Critical Analysis and Equity and Identity in the United States

_____ (3) ()

FREE ELECTIVES (4 credits)

_____ (3) () _____ (1) ()

Prerequisites

Some courses in the major requirements and electives above have prerequisites. Students are required to double check course prerequisites and equivalents. Please see your advisor or consult the Undergraduate Course Catalog for more information.

Acceptable Substitution

MATH 2534: MATH 3034 Introduction to Proofs

Progress Toward Degree

Three conditions are required for continuation in the major:

- (1) Upon having attempted 72 total credit hours (including transfer, AP, advanced standing, credit by examination, course withdrawal) majors must have completed the following courses with grades of C- or better in a maximum of two attempts (including attempts that were withdrawn): MATH 1225; MATH 1226; MATH 2114; (CMDA 2005 and CMDA 2006) or (STAT 3005, 3006, 3104; MATH 2204, 2214).
- (2) Upon having attempted 72 total credit hours (including transfer, AP, advanced standing, credit by examination, course withdrawal) majors must have completed the following courses with grades of C or better in a maximum of two attempts (including attempts that were withdrawn): (CS 1064 and CS 2064) or CS 1114; CS 2114.
- (3) Upon having attempted 12 credits of courses designated as counting for the in-major GPA (not including credits from withdrawn courses), students must maintain an in-major GPA of 2.0 or better.

Foreign Language Requirement

Students who did not successfully complete at least two years of a single foreign, classical, or sign language during high school must successfully complete six credit hours of a single foreign, classical, or sign language at the college level. Courses taken to meet this requirement do not count toward the hours required for graduation. Please consult the Undergraduate Catalog for details.

Graduation Requirements

120 credit hours are required for graduation. These credits must include the courses required for the major (see above sections). To graduate, a student must have at least a 2.0 in-major GPA and overall GPA. If 120 credit hours are reached and a student does not meet the GPA requirement, the student must take additional in-major courses to raise the in-major GPA to a 2.0.