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

For students entering under UG catalog 2023–2024

CORE REQUIREMENTS (18 credits)
Complete all following courses in CMDA and Mathematics.
*Courses marked with * will be used for computing the "in major" GPA.*

CMDA 3605 *	Mathematical Modeling: Methods and Tools *(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))*	(3)( )
CMDA 3606 *	Mathematical Modeling: Methods and Tools *(Pre: CMDA 3605)*	(3)( )
CMDA/CS 3634 *	Computer Science Foundations for Computational Modeling & Data Analytics *(Pre: CS 2114)*	(3)( )
CMDA/CS/STAT 3654 *	Introductory Data Analytics & Visualization *(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))*	(3)( )
CMDA/CS/STAT 4654 *	Intermediate Data Analytics and Machine Learning *(Pre: (STAT 3654 or CS 3654 or CMDA 3654), (STAT 3104 or STAT 4106 or STAT 4706 or CMDA 2006))*	(3)( )
MATH 2114 *	Introduction to Linear Algebra *(Pre: MATH 1225 or MATH 1226)*	(3)( )

MAJOR REQUIREMENTS (24 credits)
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.*

CMDA 1634 *#	Discovering Computational Modeling and Data Analytics	(3)( )
CMDA 2005 *†	Integrated Quantitative Sciences *(Pre: MATH 1226, Co: MATH 2114)*	(6)( )
CMDA 2006 *†	Integrated Quantitative Sciences *(Pre: CMDA 2005, (MATH 2114 or MATH 2114H))*	(6)( )
CS 1064 *‡	Introduction to Programming in Python	(3)( )
CS 2064 *‡	Intermediate Programming in Python *(Pre: CS 1064)*	(3)( )
CS 2114 *	Software Design and Data Structures *(Pre: CS 1114 or CS 2064)*	(3)( )

GEOSCIENCES OPTION REQUIREMENTS (4 credits)
Complete all following Geosciences courses.
*These courses, marked with *, will be used for computing the "in major" GPA.*

GEOS 1104 *	Introduction to Earth Sciences Laboratory	(1)( )
GEOS 3024 *	Computational Methods in the Geosciences *(Pre: MATH 1225 or MATH 1025)*	(3)( )

GEOSCIENCES COURSES FOR THE GEOSCIENCES OPTION (3 credits)
Complete one of the following courses.
*These courses, marked with *, will be used for computing the "in major" GPA.*

GEOS 3204 *	Sedimentology-Stratigraphy *(Pre: (GEOS 1004 or 2024 or 2104))*	(3)( )
GEOS 3404 *	Elements of Structural Geology *(Pre: (GEOS 1004 or 2024 or 2104))*	(3)( )

GEOSCIENCE ELECTIVES FOR THE GEOSCIENCES OPTION (9–12 credits)
Complete three courses from the list below, including at least one experiential learning course marked with #.
(GEOS 3204 or GEOS 3404 can be counted here if not used to satisfy the previous requirement.)
*These courses, all marked with *, will be used for computing the "in major" GPA.*

GEOS 3034 *	Oceanography	(3)( )
GEOS 3104 *#	Elementary Geophysics *(Pre: (GEOS 1004 or 2024 or 2104), (MATH 1026 or 1226), (PHYS 2205 or 2305); Co: (PHYS 2206 or 2306))*	(3)( )
GEOS 3204 *#	Sedimentology-Stratigraphy *(Pre: (GEOS 1004 or 2024 or 2104))*	(3)( )
GEOS 3404 *#	Elements of Structural Geography *(Pre: (GEOS 1004 or 2024 or 2104))*	(3)( )
GEOS/GEOG 4084 *	Modeling with Geographic Information Systems *(Pre: Senior Standing and GEOG 2084)*	(3)( )
GEOS 4124 *	Seismic Stratigraphy *(Pre: GEOS 3104, GEOS 3204)*	(3)( )
GEOS 4164 *#	Potential Field Methods in Exploration Geophysics *(Pre: (MATH 2204 or MATH 2204H), MATH 2214, PHYS 2306, GEOS 3104)*	(4)( )
GEOS 4174 *	Exploration Seismology *(Pre: (MATH 2204 or MATH 2204H), MATH 2214, PHYS 2305, GEOS 3104)*	(4)( )
GEOS/GEOG 4354 *#	Introduction to Remote Sensing	(3)( )
GEOS 4804 *#	Groundwater Hydrology *(Pre: (MATH 1226 or MATH 1026), (PHYS 2205 or PHYS 2305))*	(3)( )
GEOS 4924 *#	Tectonics *(Pre: (MATH 1025 or MATH 1225), (PHYS 2205 or PHYS 2305))*	(4)( )

REQUIREMENTS FOR THE COLLEGE AND UNIVERSITY PATHWAYS GENERAL EDUCATION (47 credits)

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

GEOS 1004 Introduction to Earth Sciences (3) ( )
GEOS 1014 Evolution of the Earth-Life System (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 (12–15 credits)

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

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

_____ (3) ( )

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.

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.