College of Science

Bachelor of Science in Computational Modeling and Data Analytics

Major in Computational Modeling and Data Analytics (CMDA)

Option: Biological Sciences

For students graduating in calendar year **2021**

CORE REQUIREMENTS (39 credits)

*Complete all following courses in CMDA, Computer Science, and Mathematics. Courses marked with * will be used for computing the "in major" GPA. In accordance with State Council guidelines, courses used to fulfill the SCHEV approved degree core may not also be used to meet Curriculum for Liberal Education or major requirements.*

CMDA 2005*#	Integrated Quantitative Sciences	(6)( )
CMDA 2006*#	Integrated Quantitative Sciences	(6)( )
CMDA 3605*	Mathematical Modeling: Methods and Tools	(3)( )
CMDA 3606*	Mathematical Modeling: Methods and Tools	(3)( )
CMDA/CS 3634*	Computer Science Foundations for Computational Modeling & Data Analytics	(3)( )
CMDA/CS/STAT 3654*	Introductory Data Analytics & Visualization	(3)( )
CMDA/CS/STAT 4654*	Intermediate Data Analytics and Machine Learning	(3)( )
CMDA 4864*	CMDA Capstone	(3)( )
CS 1114	Introduction to Software Design	(3)( )
CS 2114	Software Design and Data Structures	(3)( )
MATH 2114	Intro to Linear Algebra	(3)( )

MATH 2204, MATH 2214, STAT 3005, STAT 3006 & STAT 3104 will substitute for CMDA 2005 and 2006.

CHEMISTRY COURSES FOR THE BIOLOGICAL SCIENCES OPTION (6 credits)

Complete the following courses.

CHEM 1035	General Chemistry	(3)( )
CHEM 1036	General Chemistry	(3)( )

BIOLOGICAL SCIENCES COURSES FOR THE BIOLOGICAL SCIENCES OPTION (6 credits)

*Complete two of the five following courses. These courses, marked with * will be used for computing the "in major" GPA.*

BIOL 2004*	Genetics	(3)( )
BIOL 2134*	Cell Function & Differentiation	(3)( )
BIOL 2604*	General Microbiology	(3)( )
BIOL 2704*	Evolutionary Biology	(3)( )
BIOL 2804*	Ecology	(3)( )

BIOL/SYSB ELECTIVES FOR THE BIOLOGICAL SCIENCES OPTION (6-8 credits)

*Complete two courses from the list below. These courses, marked with *, will be used for computing the "in major" GPA.*

BIOL 4004*	Freshwater Ecology	(4)( )
BIOL 4114*	Global Change Ecology	(3)( )
BIOL 4134*	Evolutionary Genetics	(3)( )
BIOL 4564*	Infectious Disease Ecology	(3)( )
BIOL 4624*	Microbial Genetics	(3)( )
BIOL 4664*	Virology	(3)( )
BIOL 4874*	Cancer Biology	(3)( )

BIOL/SYSB FOR THE BIOLOGICAL SCIENCES OPTION, *continued*

SYSB 3035*	Systems Biology of Genes and Proteins	(4)( )
SYSB 3036*	Systems Biology of Genes and Proteins	(4)( )
SYSB 3115*	Network Dynamics and Cell Physiology	(4)( )
SYSB 3116*	Network Dynamics and Cell Physiology	(4)( )
BIOL/SYSB/ CMDA 4994*‡	Undergraduate Research	(3)( )

‡ A maximum of 3 credits of BIOL 4994, SYSB 4994 or CMDA 4994 may count as a BIOL/SYSB elective.

CMDA ELECTIVES FOR BIOLOGICAL SCIENCES OPTION (3 credits)
*Complete one course from the list below. This course, marked with *, will be used for computing the "in major" GPA.*

CMDA/STAT 4664*	Computational Intensive Stochastic Modeling	(3)( )
CS 3824*	Introduction to Computational Biology and Bioinformatics	(3)( )
MATH 4454*	Applied Mathematical Modeling	(3)( )
STAT 4364*	Introduction to Statistical Genomics	(3)( )

REQUIREMENTS FOR THE COLLEGE AND UNIVERSITY CURRICULUM FOR LIBERAL EDUCATION (40 credits)
Consult the University Undergraduate Course Catalogue or the CLE Guide at http://www.cle.prov.vt.edu for approved courses.

Area 1: Writing and Discourse

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

Area 2: Ideas, Cultural Traditions and Values

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

Area 3: Society and Human Behavior

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

Area 4: Scientific Reasoning and Discovery

BIOL 1105 Principles of Biology (3) ( ) BIOL 1106 Principles of Biology (3) ( )
BIOL 1115 Principles of Biology (1) ( ) BIOL 1116 Principles of Biology (1) ( )

Area 5: Quantitative and Symbolic Reasoning

MATH 1225 Calculus of a Single Variable (4) ( ) MATH 1226 Calculus of a Single Variable (4) ( )

Area 6: Creativity and Aesthetic Experience

_____ (3) ( )

REQUIREMENTS FOR THE COLLEGE AND UNIVERSITY CURRICULUM FOR LIBERAL EDUCATION, *continued*

Area 7: Critical Issues in a Global Context

_____ (3) ( )

FREE ELECTIVES (18-20 credits)

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

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

_____ (4) ( ) _____ (4) ( )

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 semester credits (including transfer, AP, advanced standing, credit by examination, course withdrawal) majors must have completed the following courses with grades of **C**⁻ or better in two or fewer 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); BIOL 1105; BIOL 1115; BIOL 1106; BIOL 1116; CHEM 1035; CHEM 1036.
(2) Upon having attempted 72 semester credits (including transfer, AP, advanced standing, credit by examination, course withdrawal) majors must have completed the following courses with grades of **C** or better in two or fewer attempts (including attempts that were withdrawn): CS 1114; CS 2114.
(3) Upon having attempted 90 semester credits, students must have 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 semester 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.