

College of Science  
**Bachelor of Science in Computational Modeling and Data Analytics**  
Major in Computational Modeling and Data Analytics (CMDA)  
For students graduating in calendar year 2018

**CORE REQUIREMENTS (50 Credits)**

*Complete all following courses in CMDA, Statistics, Math, & Computer Science*

**RESTRICTED ELECTIVES (12 Credits)**

*Complete four courses from the list below*

|                                 |   |        |                              |   |        |
|---------------------------------|---|--------|------------------------------|---|--------|
| CMDA 3605* <sup>1</sup>         | Math Modeling: Methods, Tools (Pre: CMDA 2006)  | (3)( ) | CMDA 4604*                   | Int Topics in Math Modeling (Pre: CMDA 3606)  | (3)( ) |
| CMDA 3606*                      | Math Modeling: Methods, Tools (Pre: CMDA 3605)  | (3)( ) | CMDA/STAT 4664*              | Computational Stochastic Modeling (Pre: CMDA 2006)  | (3)( ) |
| CMDA/CS 3634*                   | CS Founds for CMDA (Pre: CS 2114)   | (3)( ) | CMDA 4964/4994* <sup>2</sup> | Field Study/Undergraduate Research  | (3)( ) |
| CMDA/STAT/CS 3654* <sup>1</sup> | Intr Data Analytics and Visualization (Pre: CMDA 2006, CS 1114)                                     | (3)( ) | CS 3114*                     | Data Structures and Algorithms (Pre: CS 2114, 2505, MATH 2534)  | (3)( ) |
| CMDA/STAT/CS 4654* <sup>1</sup> | Intermed Data Analytics & ML (Pre: CMDA 2006)   | (3)( ) | CS 4104*                     | Data and Algorithm Analysis (Pre: CS 3114; MATH 3034 or 3134)   | (3)( ) |
| CMDA 4864* <sup>1</sup>         | CMDA Capstone (Pre: (CMDA 3605, 3606) or (CMDA 3654, 4654) or (CMDA 3634, CS 2114))                 | (3)( ) | CS 4824*                     | Machine Learning (Pre: ECE 2574, STAT 4604 or STAT 4705 or STAT 4714)                                 | (3)( ) |
| CS 1114                         | Introduction to Software Design   | (3)( ) | CS 4604*                     | Database Management Systems (Pre: CS 3114)  | (3)( ) |
| CS 2114                         | Software Design and Data Structures (Pre: CS 1114 (C) or CS 1124 (C))                               | (3)( ) | MATH 3134*                   | Applied Combinatorics (Pre: MATH 1226, MATH 2534 or MATH 3034)  | (3)( ) |
| MATH 1225                       | Calculus of a Single Variable   | (4)( ) | MATH 4144*                   | Linear Algebra (Pre: MATH 3144)   | (3)( ) |
| MATH 1226                       | Calculus of a Single Variable (Pre: MATH 1225)  | (4)( ) | MATH 4175*                   | Cryptography (Pre: MATH >3000 + some programming)   | (3)( ) |
| MATH 2114                       | Introduction to Linear Algebra (Pre: MATH 1225 (B) or MATH 1226 (P))                                | (3)( ) | MATH 4176*                   | Cryptography (Pre: MATH 4175)   | (3)( ) |
| MATH 2204* <sup>#</sup>         | Intro Multivariable Calculus (Pre: MATH 1226)   | (3)( ) | MATH 4425*                   | Fourier Series PDE (Pre: MATH 2214, 2204, 3224)   | (3)( ) |
| MATH 2214* <sup>#</sup>         | Intro Differential Equations (Pre: MATH 2114, 1226)   | (3)( ) | MATH 4426*                   | Fourier Series PDE (Pre: MATH 4425)   | (3)( ) |
| STAT 3005* <sup>#</sup>         | Statistical Methods (Pre: MATH 1226)  | (3)( ) | MATH 4445*                   | Numerical Analysis (Pre: MATH 2214, 2204)   | (3)( ) |
| STAT 3006* <sup>#</sup>         | Statistical Methods (Pre: STAT 3005)  | (3)( ) | MATH 4446*                   | Numerical Analysis (Pre: MATH 2214, 2204)   | (3)( ) |
| STAT 3104* <sup>#</sup>         | Probability & Distributions (Pre: (MATH 1206 or 1226 or 2015 or 1026 or 1526), (MATH 3005 or 3615)) | (3)( ) | STAT 4004*                   | Methods Statistical Computing (Pre: STAT 4105, 4214)  | (3)( ) |
|                                 |   |        | STAT 4204*                   | Experimental Designs (Pre: STAT 3006 or 3616 or 4106 or 4706)   | (3)( ) |
|                                 |   |        | STAT 4214*                   | Methods of Regression Analysis (Pre: STAT 3006 or 3616 or 4106 or 4706)                               | (3)( ) |
|                                 |   |        | STAT 4364*                   | Introduction to Statistical Genomics (Pre: STAT 3006, MATH 1226, CS 1044 or 1054 or 1114)             | (3)( ) |
|                                 |   |        | STAT 4444*                   | Applied Bayesian Statistics (Pre: MATH 2204; STAT 3104 or 4105 or 4705 AND STAT 3006 or 3616 or 4706) | (3)( ) |
|                                 |   |        | STAT 4504*                   | Applied Multivariate Analysis (Pre: STAT 3006 or 4706)  | (3)( ) |
|                                 |   |        | STAT 4534*                   | Applied Time Series (Pre: STAT 3006)  | (3)( ) |
|                                 |   |        | PHYS 4755*                   | Intro Computational Physics (Pre: PHYS 2306, CS 1044)   | (3)( ) |
|                                 |   |        | PHYS 4756*                   | Intro Computational Physics (Pre: PHYS 4455, 4755)  | (3)( ) |
|                                 |   |        | BIOL 4075*                   | Bioinformatics Methods (Pre: BIOL 3774, BCHM 3114)  | (3)( ) |
|                                 |   |        | BIOL 4076*                   | Bioinformatics Methods (Pre: BIOL 3774, BCHM 3114)  | (3)( ) |

\* Courses for computing "in-major GPA."

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

1 Prerequisites for this course include MATH 2114, MATH 2214, MATH 2204, STAT 3005, STAT 3006, and STAT 3104.

2 A maximum of 3 credits from either 4964, Field Study (for internship or other summer experience), or 4994, Undergraduate Research, may count as a CMDA elective with prior approval from the COS.

**Prerequisites:** Students are required to double check course prerequisites and equivalents.

**Progress Toward Degree** (two 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): STAT 3005, 3006, 3104; MATH 1225, 1226, 2114, 2204, 2214; CS 1114, 2114.

(2) Upon having attempted 90 semester credits, students must have an in-major GPA of 2.0 or better.

**Foreign Language**

The College of Science requires three units of a single foreign or classical language during high school or the second semester of a college-level foreign or classical language. These credit hours do not count toward the total minimum hours required for the declared degree program.

**Graduation Requirements:** 120 credit hours are required for graduation. These credits must include the courses required for the major (see above section). 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.

Requirements for the College and University Curriculum for Liberal Education (CLE)

Consult the University Undergraduate Course Catalogue or the CLE Guide at <http://www.cle.prov.vt.edu/> for approved courses.

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|-------------------------|
| <b>Area 1</b>           |
| Writing & Discourse (6) |
| _____ (3) ( )           |
| _____ (3) ( )           |

|   |
|---|
| <b>Area 2</b>                           |
| Ideas, Cultural Traditions & Values (6) |
| _____ (3) ( )                           |
| _____ (3) ( )                           |

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|------------------------------|
| <b>Area 3</b>                |
| Society & Human Behavior (6) |
| _____ (3) ( )                |
| _____ (3) ( )                |

|                            |         |
|----------------------------|---------|
| <b>Free Electives (26)</b> |         |
| _____                      | (3) ( ) |
| _____                      | (3) ( ) |
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| _____                      | (3) ( ) |
| _____                      | (3) ( ) |
| _____                      | (3) ( ) |
| _____                      | (3) ( ) |
| _____                      | (2) ( ) |

|                                      |
|--------------------------------------|
| <b>Area 4</b>                        |
| Scientific Reasoning & Discovery (8) |
| _____ (4) ( )                        |
| _____ (4) ( )                        |

|                                       |
|---------------------------------------|
| <b>Area 6</b>                         |
| Creativity & Aesthetic Experience (3) |
| _____ (3) ( )                         |

|   |
|---|
| <b>Area 7</b>                           |
| Critical Issues in a Global Context (3) |
| _____ (3) ( )                           |

A note about CLE Area 4 requirements: You must take 2 semesters of the same lab science (including labs).