

# Matter and Motion (M&M)

Fall, Winter, Spring 2022-2023

<https://sites.evergreen.edu/mnm2223/>

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**Students planning to join M&M in the winter:** We assume that you have already completed the work from fall quarter in whatever subject areas you plan to join us in the winter. Please contact the relevant faculty by email to get the final exams from fall quarter so you can figure out what you need to review over the winter break. We want to be sure that you are prepared for class on the first day of winter quarter. You will also need to get a faculty signature to register if you are joining in winter quarter.

## Weekly Schedule for Winter Quarter and Assignment Due Dates

(This program plans to meet fully in-person)

Monday	Tuesday	Wednesday	Thursday	Friday
	9:00-11:15 Maths	9:00-10:45 Physics	9:00-10:30 Physics (1, 2, 4, 7, 8) OR Chem Exam (3, 6, 9) or Math Exam (5, 10)	9:00-12:00 Chemistry Lab
	break	break	break	
	11:30-1:30 Chemistry	11:00-1:00 Maths	10:45-12:15 Chemistry	12:00-1:00 Break
			12:15-1:15 Break	1:00-5:00 Physics Lab & Workshop
			1:15-2:30 Physics	
			break	
			2:45-4:15 Chemistry	
Chemistry Lab Report due noon (Canvas)	Math Homework due 9am	Physics Problem Set due 9am		Chemistry Pre-Lab due 9:00am
Physics Lab Summary due 4pm (Canvas)	Chemistry Homework due 4pm (Canvas)	Physics Quiz due 9am		Physics Quiz Revisions due Sun. 11:59pm (Canvas)
	Physics Quiz available at 4pm			

### Anticipated Credit Equivalencies (Winter):

4 credits – Calculus II OR Precalculus II

6 credits – Calculus-Based Physics II with Lab OR Algebra-Based Physics II with Lab

6 credits – General Chemistry II with Lab

Calculus-based Physics II requires Calculus II as a co-requisite. So students must either be taking Calculus II alongside Physics, or have previously been successful in Calculus II.

Algebra-based Physics II requires Precalculus II as a co-requisite. So students must either be taking Precalculus II alongside physics, or have previously been successful in Precalculus II.

**Partial Credit Options:** Students interested in partial credit options should register for the full 16 credits, then contact faculty to discuss the reduced credit options. Students with questions about the various credit options or about their readiness for any portion of the program should contact any of the faculty team via email.

**Textbooks (same as fall quarter):** (see <https://sites.evergreen.edu/mnm2223/texts/> for details)

Physics:	<b>Matter and Interactions, 4th edition</b> , Chabay & Sherwood. ISBN: 9781118875865 (bound) or ISBN: 9781119455752 (loose-leaf)
Math (Precalculus students only):	<b>Functions Modeling Change: A Preparation for Calculus, 5th ED</b> . Connally, Hughes-Hallett, Gleason, et. al. ISBN: 9781118986301 (hardcover) or ISBN: 9781118583197 (paperback).
Math (Calculus students only):	<b>Calculus: Concepts and Contexts, 4th edition</b> , Stewart. ISBN: 9780495557425
Chemistry:	<p><b>Chemistry, 9th Edition</b>, Zumdahl &amp; Zumdahl. ISBN: 9781133611097 (please note that this is an older edition. The current edition is the 10<sup>th</sup> edition)</p> <p><b>Mole Concepts and Stoichiometry: A Chemistry Workbook</b>, Bopegedera. ISBN: 9781607977445</p> <p><b>Notebook #2001</b>, 192 numbered pages, <b>Published by the Scientific Notebook Company</b> (chemistry lab notebook – <b>available at the campus bookstore or online</b>) – for lab</p> <p>Lab coat and goggles that fit you well and provide good eye protection</p>

Textbooks can be expensive. However, these texts cover the entire year, and students will be required to have access to these texts for successful completion of the program. Used versions or bookstore rentals are acceptable.

**Prerequisites:** The most important prerequisites are college level study skills and the **appropriate math background**.

**This year, Matter and Motion has two tracks available, with part-time and full-time options within each track.**

- **Pre-calculus track**
- **Calculus track**

Observations of the natural world reveal an underlying order, which scientists try to understand through model building and experimentation. Physical scientists seek to reveal the fundamental nature and composition of matter and its interactions - essential to understanding modern technological society as well as our environment. This rigorous program integrates first-year college chemistry and physics with math to explore how scientists make sense of the natural world. A special focus will be the physical science of climate change. Students will work to develop a firm background in college-level science, becoming prepared for further intermediate and advanced work in the mathematical and physical sciences.

The work will be intensive and challenging but also exciting; students should expect to spend at least 50 hours per week engaged with material during and outside of class. Important for success will be a commitment to working hard and effectively in groups. The program will include readings, lectures, labs, workshops, seminars, and projects, along with homework sets, writing assignments, quizzes, and exams. Students can expect to spend at least a full day in lab each week, maintain lab notebooks, and write formal lab reports.

All areas of the program will emphasize the use of mathematical methods and developing critical thinking and communication skills. Successful students will improve their conceptual understanding and problem-solving abilities, their ability to collaborate effectively, and gain hands-on experience in physical science. Students will apply these skills and knowledge to complex problems showing the rich inter-connectedness of mathematical and physical systems.

Depending on their math background, students will choose between precalculus or calculus. Fall and winter precalculus covers functions that model change, including linear, polynomial, exponential, logarithmic, trigonometric, and rational functions, as well as parametric and polar curves. Calculus will cover the techniques, concepts, and applications of differential calculus (in fall) and integral calculus (in winter). In spring, calculus topics will include partial derivatives, multiple integrals, and sequences and series. Math topics will be linked to models in the physical sciences and climate change.

Fall quarter general chemistry included fundamental concepts of atomic structure, stoichiometry, the periodic table, and bonding models. Winter quarter will build on this foundation, emphasizing kinetics, thermochemistry, and acid-base chemistry. Spring quarter will emphasize chemical equilibria and the relationship between free energy and equilibrium.

Students may choose between algebra-based physics (taken concurrently with precalculus) or calculus-based physics (taken concurrently with calculus). Fall quarter physics started with the study of classical mechanics and focused on matter and its interactions at the macroscopic and microscopic levels, fundamental conservation laws, and introducing computer modeling. Winter quarter concludes our study of classical mechanics and begins the study of electricity and magnetism. In spring, we finish our study of electric and magnetic interactions and waves.

By the end of the program, successful students will be prepared for upper-division work that has a general chemistry prerequisite, and depending on the track chosen, will be prepared for upper-division work in mathematics and physics. Particular upper-division Evergreen science programs that students may be prepared for include: Atoms, Molecules, and Reactions (2023-24); Mathematical Systems (2023-24); Physical Systems and Applied Mathematics (2024-25); and Environmental Analysis (2024-25).