Models of Motion, 2014-15

Program Syllabus – Winter Quarter Updates

sites.evergreen.edu/motion

Models of Motion is a full-time three-quarter long interdisciplinary program that integrates the study of calculus and physics and places them in their cultural and historical context as exemplars of human experience, endeavor, and achievement. Upon completion, students will have gained hands-on experience with and a working knowledge of scientific and mathematical concepts, an ability to reason critically about and solve applied and fundamental problems in physics and math, and an increased understanding of the development of human thinking about these topics.

Students who successfully complete the winter quarter of this program should achieve process skills and content mastery equivalent to:

- one quarter of integral calculus (suggested course equivalency (SCE): 6 credits in Calculus II with Lab);
- one quarter of calculus-based physics (electricity & magnetism) (SCE: 6 credits in University Physics II with Lab);
- one quarter of a seminar on math in society (SCE: 4 credits in Seminar on Math in Society).

Texts:

Calculus: Strang, *Calculus*, 2nd ed
Physics: Mazur, *Principles and Practice of Physics*, 1st ed, plus **MasteringPhysics** access
Seminar: Simonyi, *A Cultural History of Physics*
Strogatz, *The Elements of Math*, articles available at
http://topics.nytimes.com/top/opinion/series/steven_strogatz_on_the_elements_of_math/index.html
Ascher, *Mathematics Elsewhere*

Weekly Schedule			
Monday	**Tuesday**	**Wednesday**	**Thursday**
9:00 – 10:00 Quiz Lecture Hall 2	9:00 – 10:30 Problem Session Sem 2 D2105	9:00 – 10:15 Math Lecture Lecture Hall 2	9:00 – 11:00 Seminar Sem 2 D3105
10:15 – 11:15 Physics Lecture Lecture Hall 2	10:45 – 12:00 Seminar Sem 2 D2105	10:30 – 12:00 Physics Lecture Lecture Hall 2	12:00 – 1:30 Problem Session Sem 2 D3105
12:15 – 3:00 Math Lecture & Lab CAL West	1:00 – 4:00 Physics Lab Lab 1 2046		

Schedule of reading assignments (may be subject to change):

Week	Math	Physics	Seminar	Notes
11	Strang 5.1, 5.2, 5.3	Relativity Ch. 1 Relativity Ch. 2	Strogatz 1 Simonyi 5.1 – 5.4	
12	Strang 5.4, 5.5, 5.6	Relativity Ch. 3 Relativity Ch. 4	Simonyi 5.5 – 5.7	
13	Strang 5.7, 5.8	Mazur Ch. 22	Strogatz 2, 3, 4 Ascher 1	No class meetings Mon. Jan. 19 (Martin Luther King, Jr. Day)
14	Strang 6.1, 6.2, 6.3	Mazur Ch. 23	Strogatz 5, 6, 7, 8 Ascher 2	
15	Strang 6.4, 6.5	Mazur Ch. 24	Strogatz 9, 10, 11 Ascher 3	Midterm Exams
16	Strang 7.1, 7.2, 7.3	Mazur Ch. 25 Mazur Ch. 27	Strogatz 12, 13 Ascher 4	
17	Strang 7.4, 7.5	Mazur Ch. 28	Strogatz 14, 15 Ascher 5	No class meetings Mon. Feb. 16 (Presidents' Day)
18	Strang 8.1, 8.2, 8.3	Mazur Ch. 29	Ascher 6, 7	
19	Strang 8.5, 8.6	Mazur Ch. 30	--	Final Papers & Presentations
20	--	--	--	Final Exams
Evaluation Week				

Activities, Assignments, and Assessments

- All students will participate in weekly ***Lectures***, ***Labs***, ***Problem Sessions***, and ***Seminars***.
- Regular weekly assignments include ***Reading Assignments***, ***Reading Responses***, ***Problem Sets***, and ***Seminar Assignments*** (weekly Seminar Assignments are described further in the Winter Quarter Seminar handout).
- Each week, there will be a ***Quiz***.
- In week 15, there will be a ***Midterm Exam***.
- In week 19, there will be a ***Final Seminar Paper*** and ***Presentation***.
- In week 20, there will be a ***Final Exam***.
- Throughout the quarter, you will maintain a ***Portfolio*** of your work, due at the end of the quarter.
- Refer to the Fall Quarter Syllabus, program web site, and Winter Quarter Seminar handout for details of above.

Program Learning Goals

Through your work in winter quarter, you will have the opportunity to:

- Improve your ability to articulate and assume responsibility for your own work.
- Strengthen your collaborative skills and the ability to respond in useful ways to the work of colleagues.
- Improve your skills in clear communication of cultural/historical, mathematical, and scientific ideas, both orally and in writing.
- Improve your ability to analyze the structure, content, and objectives of a text with focus on developing conceptual understanding and procedural skills and understanding themes and argument.
- Gain a deeper understanding of mathematical thinking by exploring how non-Western cultures have incorporated mathematics.
- Develop a broad and deep understanding of a mathematical or physical concept and clearly communicate the key features of that concept to a non-specialist audience.
- Deepen your prerequisite understanding of the concepts of function (including exponential and logarithmic functions), slope, limits, as well as solidifying and furthering your prerequisite understanding of differential calculus.
- Learn the definition of the integral and be able to relate it to algebraic, numerical, graphical, or verbal descriptions and data.
- Calculate integrals using a variety of standard techniques.
- Use integration in applied problems, particularly in the context of the physical sciences.
- Solidify your prerequisite understanding of concepts and problem solving related to classical mechanics (kinematics, dynamics, and conservation principles).
- See the central role that unification plays in physics.
- Experience that physics is both a mathematical and an experimental science.
- Use the main ideas of special relativity and electricity and magnetism to solve fundamental and applied problems.

Our work will take place in the context of an Evergreen learning community, and we will be responsible for our interactions within the group as well as our individual learning. In this context, it is important to keep in mind the institutional-level expectations and approaches that form the backdrop of our work together. These are articulated by the College in terms of the “Expectations of an Evergreen Graduate” and “Five Foci of Learning”.

In all areas of the program, credit will be earned based on your:

- **demonstrated understanding of the material;**
- **timely submission of assignments;**
- **engagement (including attendance, participation, and effort).**

All of these will be evaluated with the program learning goals in mind.