

Physical Systems and Applied Mathematics, 2016-17
Program Syllabus – Fall Quarter
 sites.evergreen.edu/psam1617
 www.wamap.org

This intermediate-to-advanced program builds on previous introductory work in calculus and calculus-based physics to deepen students' understanding of nature and how it can be represented via physical models, and the powerful connections between mathematics and physical theories. In fall, we study classical mechanics, ordinary & partial differential equations, and multivariable & vector calculus. In winter, we study electricity & magnetism, quantum mechanics, and linear algebra. In spring, we continue to study electricity & magnetism and quantum mechanics and complete a major project. There are partial credit options for the math portions of the program; students may earn upper division science credit in math with exceptional performance. All work in physics is designed to be upper division. We devote time to looking at our studies in a broader historical, philosophical, and cultural context. We constantly strive to create an intentionally inclusive and anti-bias learning environment that is attentive to and supportive of the unique gifts and background of each student with the goal of equitable outcomes for all.

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Fall Schedule:

MONDAY	TUESDAY	WEDNESDAY	THURSDAY
9:00 – 11:00 Multivariable & Vector Calculus Sem 2 D3105	9:00 – 11:00 Differential Equations Sem 2 D3105	9:00 – 11:00 Multivariable & Vector Calculus Sem 2 D3105	9:00 – 11:00 Differential Equations Sem 2 D3105
11:00 – 12:30 <i>Open Study/ Lunch Break Sem 2 D3105</i>	<i>Lunch Break</i>	11:30 – 12:30 All-Program Meeting* Sem 2 D3105	11:00 – 12:30 <i>Open Study/ Lunch Break Sem 2 D3105</i>
12:30 – 2:30 Classical Mechanics Sem 2 D3105	12:30 – 4:00 Classical Mechanics CAL West	*optional for students registered for <8 credits	12:30 – 2:30 Classical Mechanics Sem 2 D3105

Expected credit distribution, fall quarter:

Multivariable and Vector Calculus – 4 credits
 Differential Equations – 4 credits
 Classical Mechanics – 8 credits

Special Needs: Students who require accommodations for academic work should contact Access Services (<http://evergreen.edu/access/> ph. 360-867-6348/TTY: 360-867-6834). Information about such accommodations is confidential and protected by legal and ethical considerations.

Awarding of credit: In order to earn credit, students must demonstrate competency on all coursework, including written exams. All work will be evaluated with the program learning goals (see below) in mind. For the math portion of the program, students will also need to demonstrate satisfactory performance on the 8 outcomes on the Assessment Grid (available on WAMAP); both the student and the faculty will assess these outcomes for each exam. Students are expected to come to class prepared and to participate actively and positively in class activities. Poor attendance or poor participation in program activities will be mentioned in a student's evaluation and may result in a loss of credit. Partial credit in individual subject areas will not be awarded. Students must also complete a self-evaluation prior to evaluation conferences each quarter, and a faculty evaluation on exiting the program.

Evaluations: You must be prepared to stay until the end of evaluation week, Friday December 16, 2016. If you miss your evaluation conference, you agree to accept your evaluation as written. Your self evaluation must be completed prior to the evaluation conference. If exiting the program, your evaluations of faculty must also be posted prior to the evaluation conference. If you are only in the mathematics portion of the program, you only need to write an evaluation of Professor Foster-Grahler. Students enrolled in the full program should write evaluations for both faculty.

Texts: Earlier editions are acceptable, though students are responsible for adjusting to discrepancies between editions, especially in exercise and problem numbering.

- **Elementary Differential Equations and Boundary Value Problems, 10th Edition.** Boyce and DiPrima. 2012. ISBN: 9780470458310. (for differential equations)
- **Calculus: Single and Multivariable, 6th Edition.** Hughes-Hallett, et.al. 2012. ISBN: 9780470888612. Actually only need **Calculus: Multivariable, 6th Edition** ISBN: 9780470888674, which includes Ch. 12-21 of the full Single and Multivariable text. (for multivariable and vector calculus)
- **Div, Grad, Curl, and All That, (Fourth Edition).** Schey. 2004. ISBN: 9780393925166. (for multivariable and vector calculus in fall and for electrodynamics in winter)
- **Classical Mechanics.** Taylor. 2005. ISBN: 9781891389221. (for classical mechanics)
- NOT REQUIRED: students with their own computer may wish to purchase access to the student version of the computer program *Mathematica* for their own convenience. *Mathematica* is available in campus computer labs, so no purchase is required.

Program Learning Goals:

- Interrogate how issues of power, identity, privilege, and equity intersect with the teaching, learning, and practice of math and science.
- 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 mathematical and scientific ideas, both orally and in writing.
- Improve your reading of technical texts to develop conceptual understanding and procedural skills.
- Develop and utilize increasingly sophisticated mathematical models that describe and explain physical systems.
- Use multiple representations to gain a firm understanding of the concepts and procedures of multivariable and vector calculus and differential equations.
- Develop deep conceptual understanding and sophisticated problem-solving abilities related to classical mechanics.
- Use a computer based algebra system to visualize and solve complex problems in math and physics.

Our work will take place in a learning community, and we will be responsible for our interactions within the group as well as our individual learning. It is important to keep in mind the institutional-level expectations and approaches that form the backdrop of our work, as described in the “Six Expectations” and “Five Foci”:

Expectations of an Evergreen Graduate:

- Articulate and assume responsibility for your own work.
- Participate collaboratively and responsibly in our diverse society.
- Communicate creatively and effectively. Demonstrate integrative, independent, critical thinking.
- Apply qualitative, quantitative and creative modes of inquiry appropriately to practical and theoretical problems across disciplines.
- As a culmination of your education, demonstrate depth, breadth and synthesis of learning and the ability to reflect on the personal and social significance of that learning.

Five Foci of Learning:

- Interdisciplinary Study
- Collaborative Learning
- Learning Across Significant Differences
- Personal Engagement
- Linking Theory with Practical Applications

Homework, Assignments, and Assessments

Math:

- **Homework** will be assigned daily and due the next day we meet for that subject. Homework will be discussed in groups and reviewed by faculty at the beginning of each class.
- There will be regularly scheduled **exams** and **quizzes** as well as **pop quizzes**. Pop quizzes will usually be a problem from the homework.
- **Mathematica assignments** will usually be integrated into the homework and will either be reviewed by faculty in class or turned in.
- Several times throughout the quarter, faculty will collect the results of **in-class group problem solving**.
- **No late homework, assignments, or assessments will be accepted.**

Physics:

- **Reading Responses** are due each Monday by 9 am, online via the program website.
- **Homework Assignments** are due to be turned in at the beginning of class on Monday and Thursday.
- **Mathematica Labs** will take place most Tuesday afternoons and will be saved to your Cubbies. Some parts of *Mathematica* Labs will be submitted as part of homework.
- There will be one **Midterm Exam** and a cumulative **Final Exam**.
- **Public Solutions and Peer Review:**
 - You will select two of Taylor's *** problems that are not completed in class or assigned as homework, and produce high-quality typeset solutions (using e.g. Word, LaTeX, Mathematica, etc.). One solution must be produced by the end of week 4 and the other by the end of week 9. You will be assigned to review two solutions, to be completed by the ends of weeks 5 and 10.
 - You will also select two more of Taylor's *** problems that are not completed in class or assigned as homework, and produce high-quality narrated solutions (many formats are acceptable, such as but not limited to: pencast, screencast, filming whiteboard, narrated PowerPoint slides, etc). You will be assigned to review two solutions. The timeline is identical to the typeset solutions.
 - Additional Public Solutions may be produced to supplement a weak exam result; discuss with faculty.
- **No late homework, assignments, or assessments will be accepted.**

Seminar and Academic Statement

- **All-Program Meeting** times on Wednesdays will be used for **Seminars** and **Academic Statement** writing.
- Each student is required to write and submit to faculty an updated draft of their Academic Statement by the end of fall quarter.
- We will devote six hours of class time in fall quarter to support students in writing or updating their Academic Statement (not all of this time will be on Wednesdays).
- This work will also support **Self-Evaluation** writing; each student is required to write and submit to faculty an evaluation of their own work and achievements in the program at the end of each quarter.
- Graduating students will have individual meetings with faculty to support their final transcript Academic Statement; these meetings will take place close to the student's graduation date.
- **Seminar topics and assignments will be chosen collaboratively by students and faculty. There will be 5 seminars.**

Portfolio: Throughout the program, you will maintain a portfolio of your work consisting of all the above assignments and assessments as well as any notes or other material that reflect your work to produce a lasting record and resource for your own future reference.

**Note: Physics and math are as exciting as any movie you could ever watch in a theatre.
Please – silence your cell phones and refrain from texting while in class.**

Tentative Reading Schedule, SUBJECT TO CHANGE

	Classical Mechanics	Differential Equations	Multi-Variable & Vector Calculus	Seminar & Academic Statement
Week 1 9/26-9/30	Ch 1, Ch 2	1.1 – 1.3 2.1 – 2.2	13.1 – 13.4	“Why should physicists study history?”
Week 2 10/3-10/7	Ch 2, Ch 3, Ch 4	2.3 2.4	14.1 – 14.2, 14.6 14.4 – 14.5 (take-home quiz)	TBD
Week 3 10/10-10/14	Ch 4, Ch 5	2.8 – 2.9 EXAM	14.7, 15.1 – 15.3 EXAM	TBD
Week 4 10/17-10/21	Ch 5, Ch 6	3.1 – 3.2 3.3 – 3.4	16.1 – 16.3 16.4 – 16.5	TBD
Week 5 10/24-10/28	Ch 7, EXAM	4.1 – 4.2 5.1 – 5.3	17.1 – 17.4 18.1 – 18.2	TBD
Week 6 10/31-11/4	Ch 7, Ch 8	5.4 – 5.5 EXAM	18.3 18.4, QUIZ	TBD
Week 7 11/7-11/11	Ch 8, Ch 9	10.1 10.2 – 10.3	19.1 – 19.2 19.3 – 19.4	TBD
Week 8 11/14-11/18	Ch 11, Ch 13	10.5 10.7	20.1 – 20.2 20.3 (take-home exam)	TBD
Thanksgiving Break 11/21-11/25				
Week 9 11/28-12/2	Ch 13, Ch 12*	10.8 Ch 8*	(take-home exam due) 19.4 – 20.3	TBD
Week 10 12/5-12/9	Ch 12* EXAM	Ch 9* EXAM	EXAM	TBD
Evaluation Conferences 12/12-12/16	Don't plan to leave before Friday 12/16			

*Classical Mechanics Ch 12 and Differential Equations Ch 8 and Ch 9 support each other and are covered under the Classical Mechanics portion of the program. This combination culminates our quarter with a brief study of nonlinear differential equations and chaos. This material will not be covered on final exams.

Differential Equations Ch 7 will be covered in winter quarter as part of Linear Algebra.

Classical Mechanics Ch 10 will be assigned as part of the reading for winter break.