

catalog'r 2010-11 Fulltime Catalog

View Program [Methods of Mathematical Physics](#)

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Methods of Mathematical Physics

Fall, Winter and Spring

URL: academic.evergreen.edu/z/zita/

Faculty: [EJ Zita](#) Physics & Astrophysics

Coordinator: [EJ Zita](#)

Faculty Signature Required: Winter and Spring quarters

Major areas of study include upper division Physics & Mathematics, with history and philosophy

Class Standing: Sophomores or above; transfer students welcome.

Fields of Study: Astronomy, Mathematics, Philosophy, Philosophy of Science

Prerequisites: A full year of college level calculus and calculus-based physics. Willingness to work in teams and online. Students interested in advanced mathematics but lacking the necessary background in physics should contact the professor for advice at [zita\(at\)evergreen.edu](mailto:zita(at)evergreen.edu).

Accepts Winter Enrollment: This program may accept new students with appropriate background. Contact faculty by email or in 2272 Lab II during Academic Fair. New students should expect to complete some catch-up work during the December break.

Accepts Spring Enrollment: This program may accept new students with appropriate background. Contact faculty by email or in 2272 Lab II during Academic Fair. New students should expect to complete some catch-up work during the spring break.

A close examination of the complex and varied world around us reveals a high degree of underlying order. Our goal as scientists is to understand and explain this order. Mathematics is the language created (or discovered) to describe the order observed in physics. The goal of this advanced program is to introduce the mathematical language we use to describe and create physical models of our natural world, and to better understand both. To that end, we will study a number of key physical theories and systematically develop the mathematical tools that we need to understand them.

We plan to begin, in Fall quarter, with a review of series, complex numbers, and linear equations, including matrixes; concentrating on their applications to physics, such as rotations, circuits, and the simultaneous solution of linear equations. We will continue with ordinary and partial differential equations, with applications to classical mechanics, including oscillators, waves, Laplace's equation, Poisson's equation, and other fundamental examples in physics. Students will plan research projects in teams.

In Winter, we plan to connect differentiation with integration via vector analysis (applications in electromagnetism), Fourier Series (applications to waves, e.g. acoustic oscillations on the Sun and at the Big Bang), and Variational Calculus. We will go deeper into areas begun in Fall. For example, we would like to take vector analysis deeper into tensor analysis, with applications such as General Relativity. Students will carry out their research projects in teams.

In Spring, students may continue with a full-time study of Electromagnetism and Vector Calculus, or may continue independent contract work on their research projects in teams. Students might also have the option to begin a study of thermodynamics and statistical mechanics. Students will be encouraged to present their research at a regional professional physics meeting.

Our program work will consist of lectures, tutorials, group workshops, student presentations, computer labs, seminars on the philosophy and history of physics and mathematics, essays and responses to essays. Teamwork within an integrated learning community will be emphasized, 1) for best learning practices, and 2) to model work within mature scientific communities.

Credits: 16 per quarter

Enrollment: 25

Internship Possibilities: Spring only with faculty approval

Special Expenses: Expensive textbooks - must be in hand before the date of first use on the syllabus. Each student must have his or her own copy in class.

Program is preparatory for careers and future studies in physics, mathematics, chemistry, engineering and education

Planning Units: Scientific Inquiry

A similar program is expected to be offered in 2012-13