

# Syllabus for Math 190S-01: The Mathematics of the Universe

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## Instructor Information:

Hubert Bray, Professor of Mathematics and Physics, Duke University  
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## Course Information:

Class meets 5 p.m. to 7:05 p.m., Monday Wednesday Friday, June 29 – August 5, 2020.

## Teaching Assistant:

We are very lucky to have a former student of this class, Sam Lester, who is available to assist you in the course however he can. His email is [samuel.lester@duke.edu](mailto:samuel.lester@duke.edu).

## Office Hours:

After class, upon request. You may also schedule a meeting by email. If I am not immediately available for you, try our TA, Sam Lester (email above), who can help you with most questions.

## Course Objectives:

The goal of this seminar course is for students to gain a broad knowledge of the many ways mathematics is used to describe and understand the universe and everything within it. While the universe itself will be a favorite topic, every application of mathematics to physics, science, and the real world is fair game for discussion in class as well as the three 5-10 page papers that each student will write. The instructor will also go into some depth on selected topics within special and general relativity, astrophysics, differential geometry, calculus, and game theory. Students will learn how to solve specific types of problems on these and other topics that will be tested on daily quizzes and the final exam.

## Quizzes:

Most classes will begin with a quiz over material already covered in class as well as videos assigned to watch outside of class.

## Homework:

Mostly, students will prepare for the daily quizzes and weekly presentations on their papers. However, occasionally problems will also be assigned, due at the beginning of the next class.

## Papers:

Each student will write 4 papers (5-10 pages) on the topics of their choice related to the class, broadly interpreted.

**Final Exam:**

There will NOT be a final exam.

**Grading:**

30% Quizzes and Homework

60% Four papers. Each student will present their paper in 5 minutes.

However, the grade is based on just the paper, not the presentation.

10% Class Participation