

# Physics of Sports

Intersession 2018: AS.360.167.13

Last updated: Tuesday, December 5, 2017

Meeting Days: Monday and Friday, 6-8:30 PM  
Course website: [http://pages.jh.edu/~maliyou1/Physics\\_of\\_Sports/](http://pages.jh.edu/~maliyou1/Physics_of_Sports/)  
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Office: 5801 McAuley Hall, Room #474, Mt. Washington, Baltimore 21209  
Office Hours: By appointment only  
Pre-requisites: AS.171.101 **OR** AS.171.103 **OR** AS.171.105 **OR** AS.171.107  
Textbook (Recommended but not required):  
Title: The Physics of Sports  
Author: Michael Lisa  
Publisher: McGraw-Hill Education  
Year: 2015  
ISBN-13: 978-0073513973

## I. Course Description

While watching sports scenes you must have felt that your knowledge of physics is just not enough to understand all aspects of it. In this course, you will learn which additional forces are at play in different sports and why a curve ball curves? or why a ping pong ball dunks? You will also understand the use of energy and power in basketball, cycling, and other sports. Science has been illuminating sports for decades and will play an even more significant role in high-speed competitive sports of the future. This course will offer you a whole new way of viewing and understanding the sports you love. Group projects will help in exploring these topics further and at a deeper level.

## II. Course Goals

This is a short course which starts with the assumption that you know at least some basic mechanics. A few review sheets will be available and key concepts will be reviewed in the class too. By the end of the course, you will:

1. Develop a deeper understanding of basic physics concepts via their applications to sports.
2. Learn image, video and sound analysis (using software) to help you extract useful data from sporting events.
3. Develop an appreciation for the amount of science and engineering that goes into a sporting event, from the training of players to the design of equipment and playing fields.

## III. Format and Procedures

The course will be interactive with a lot of class activities and question answer sessions. Clickers or cell phones will be used to monitor progress. Students are encouraged to bring laptop/tablets to the class and use them if needed. Presentations will be mostly PowerPoint based, with interactive media such as photos, videos, etc.

There will be a short, 10 minutes break during the class. Class participation will be evaluated through attendance and group work. Taking part in discussions and attention are required of all students for every class meeting.

#### **IV. Course Etiquette**

This is a very short course for a very wide topic and hence we'll need to remain focused on some key ideas and student participation will be strongly encouraged. Projects will extend ideas and will give a chance to dig deeper. Attention and respect is expected from, and for, all students.

#### **V. Course Requirements:**

1. Students are expected to attend all class meetings for satisfactory completion of this course given that grades rely on class participation too. The instructor is to be given notice of any planned absence and a courtesy email before class if sick or ill. Student participation is key and any absences will impact class dynamics.
2. Course readings: There is no required textbook for this course but the book by Mike Lisa (details given on page 1 of this document) will help you understand many topics. Lecture notes and a lot of supplementary information will be uploaded to the course website.

#### **VI. Grading Procedures**

The distribution of points is as follows:

Class participation	30
Two written Assignments (due second Monday and third Friday)	30
Group project	40
Total	100

#### **VII. Academic Integrity**

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructor.

### **VIII. Accommodations for students with disabilities**

In compliance with the JHU policy and equal access laws, appropriate academic accommodations that may be required for student with disabilities can be discuss and arranged on a case by case basis. Requests for academic accommodations are to be made prior to the first class or immediately afterward, except for unusual circumstances. Students are encouraged to register with Student Disability Services to verify their eligibility for appropriate accommodations. Please contact the Office of Student Disability Services at [studentdisabilityservices@jhu.edu](mailto:studentdisabilityservices@jhu.edu) or call 410-516-4720.

### **IX. Course Schedule and Topics to be covered (subject to minor changes and adjustments)**

<b>Session</b>	<b>Topics</b> (Chapter numbers refer to the recommended text)
Session 1 Monday	Introduction to Physics of Sports and a survey of kinematics, measurement tools available, photo and video analysis. (Sections from Chapter 1 and 2)
Session 2 Friday	Role of various Forces in Sports (Chapter 3) Group Projects – Selection and confirmation
Session 3 Monday	More on Forces in Sports (Chapter 3) Quick review of Projectile Motion (Selections from Chapter 4) Additional Forces in Sports (Selections from Chapter 5)
Session 4 Friday	Physics of Basketball (Chapter 7) Physics of Ping-pong Group Projects – Midsession updates from students
Session 5 Monday	Engineering of Sporting equipment (Sections from Chapter 8)
Session 6 Friday	The Physics of Cycling (Chapter 9) Group Projects – Final submission