Physics 130
Physics of Human Motion
MWF 1:30-2:20
Henry Hall, Room 207

A. Instructor:

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B. Office hours:

Tu, Th 10:30-11:30 AM and by appointment

C. Text :

Biomechanics of Sport and Exercise (Second Edition) , Peter M. McGinnis
ISBN-13: 978-0-7360-5101-9

D. Course Description:

Introduction to the fundamentals of physics through the analysis of human motion

E. Course Learning Outcomes.

At the conclusion of the PHY130 course students will demonstrate:

1. Application of the Scientific method to design and critically interpret an experiment; experimentation (PLO#1);

2. Numerical skills that extend to fundamental units of measurement and their interconversion (PLO#2);

3. An understanding of the principles of basic mechanics, thermodynamics and electricity (PLO#2,3);

4. The ability to relate these principles to real-world situations, in particular the functional processes of human physiology, homeostasis and adaptation (movement) (PLO#2,3).

F. Grading:

The course will be graded with the following breakdown:

Attendance, Participation, Homework and Quizzes	15%
Midterms (3)	60%
Final Exam	25%

Midterms: Three midterms will be given on the following dates

Midterm 1: Friday, February 10
Midterm 2: Friday, March 9
Midterm 3: Friday, April 13

Final Exam: Date and Time: TBA

The final exam will be comprehensive

Helpful advice: Come to class every day. Take good notes and go over them after class. Ask questions. Get an early start on the homework and come get help if you get stuck. Stay on top of the material (Don't cram). If you are having difficulty come see me ASAP. Physics is not a spectator sport, the only way to get better is to practice.

Policy on Cell Phones and Music Devices.

Because electronic devices, such as cellular phones, pagers, and musical devices can be disruptive to normal classes, the following is the policy for all Natural Sciences and Mathematics classes at Chaminade. Electronic devices are also prohibited during exams.

Use of music devices and cell phones is prohibited during all Natural Science and Mathematics classes at Chaminade, unless specifically permitted by your instructor. Use of cell phones and music devices in laboratories is a safety issue. In addition, use of cell phones and music devices in any class is discourteous and may lead to suspicion of academic misconduct. Students who can not comply with this rule will be asked to leave class and may be subject to laboratory safety violation fines. Please refer any questions to the Dean of Natural Sciences and Mathematics.

Course Content:

1. Quantifying Motion

    A. Coordinate Systems
    B. Units and the Metric System
    C. Unit conversions

2. Motion in One Dimension

    A. Position, Velocity and Acceleration
    B. The 100 m dash

C. Sprinting: stride length and stride frequency

3. The Scientific Method

    A. Asking the right questions
    B. Answering questions through experimentation

4. Motion in Two Dimensions

    A. Introduction to Trigonometry
    B. Acceleration due to gravity
    C. Projectile Motion

5. Forces and Accelerations

    A. Newton's Laws
    B. Free-Body-Diagrams: Force analysis in action
    C. Statics
    D. Air Resistance in Cycling
    E. Force Analysis in Olympic Weightlifting

6. Momentum

    A. Momentum and Impulse
    B. Conservation of Momentum and Collisions
    C. The Center of Mass
    D. Center of Mass of The Human Body
    E. Center of Mass in the High Jump

7. Work and Energy

    A. Work: Force acting over a distance
    B. Kinetic Energy and Potential Energy
    C. The Work-Energy Theorem
    D. Energy in the Gym: What's the hardest excercise?

8. Energy, Power and Human Energy Production

    A. Power: The rate of energy production
    B. Units of Energy: The joule versus the calorie, dynamite versus chocolate-chip cookies
    C. Power production in various sports
    D. Metabolism
    E. VO_{2MAX}
    F. The Laws of Thermodynamics
    G. Heat, Temperature
    H. 98.6: Surviving in extreme environments

9. Rotational Motion

    A. Torque Production and Lever Arms
    B. The Moment of Inertia
    C. Conservation of Angular Momentum and its Application to Sports: The X-Games

10. Bones

A. Basic Anatomy
B Bones and their physical parameters
C. Stress, Strain and Fracture

11. Muscles

A. Basic Anatomy
B. Muscles and their lever arms
C. Muscles and their power curves

12. The Nervous System

A. Electric Fields and Electric Potentials

13. Use of Technology in Biomechanics

A. Sensors and Data Acquisition
B. High-Speed-Video and Motion Capture
C. Computers and Data-analysis

14. Lots and Lots of Applications to Sports and Exercise