

The College of William and Mary
Department of Kinesiology

Kin 308, Biomechanics of Human Movement

Spring 2006

Use the Blackboard site for lecture outlines and exam reviews.

Instructor: Dr. Ray McCoy
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Course Description

The course is designed to provide the student with information in the mechanical evaluation of human movement. Fundamental mechanical principles affecting human movement during locomotion and a variety of daily and sports activities are considered. Techniques and methods of mechanical analysis, quantitative video analysis, isometric muscle force, total body force, electromyography, and research evaluation are incorporated into laboratory projects.

Objectives of the Course

Upon successful completion of this course the student will be able to:

1. describe the human body as a system of joints, levers, and forces to mechanically evaluate human movement.
2. calculate the moments and forces of a muscle, joint, lever system during static positions and movement.
3. integrate intersegmental mechanics to evaluate normal movement patterns and sports activity patterns.
4. describe the mechanical muscle properties in creating tension.
5. describe the mechanical connective tissue properties of the body.
6. describe the properties of projectile motion.
7. read and evaluate literature pertaining to the mechanics of human movement.

Required text

Hamill, J., & Knutzen, K. (2003). Biomechanical Basis of Human Movement. Lippincott Williams & Wilkins.

<u>Grading:</u>	Exam 1	25 %
	Exam 2	25 %
	Final	25 %
	Assignments	10 %
	Lab	15 %

	Total	100 %

Lecture Outline

	Topic	Text Pages
January		
18	Introduction Trigonometry review Scalars and vectors	3-10, 13-29 Appendix D 275-278, 339-340
	Kinematics	
23 25	Linear kinematics Jumping kinematics Projectile motion Shotput article	271-307 295-303
30	Walking kinematics	289-293
February		
1	Angular kinematics	309-336
6	Walking and running angular kinematics	326-328
8	Gait Analysis article	
13	Curve fitting and data smoothing	
15	Running article review	
20	Exam # 1	
	Kinetics	
22	Types of Forces, Laws of Motion Ground reaction forces during walking and running	337-342, 350-352 342-343, 365-368
27	Pressure and Center of Pressure	359-360
	Joint reaction forces	343
	Friction	343-345
	Fluid resistance	346-348
	Inertial force	348
	Muscle force	348-349
	Elastic force	349

March	Momentum	356-358
	Collisions	
	Impulse	356-358
	Work, energy, power	360-365
	Torques (moments), Levers	381-384, 389-394
	Moment of Inertia	395-398
	Angular momentum	398-400
	Angular work, energy, and power	410-413
	Angular kinetics of Locomotion	414-416
	Exam # 2	
	Types of mechanical analyses, Statics	402-407
April	Types of mechanical analysis, Dynamics	407-410
	Biological Tissue mechanics	9-13, 38-49
	Neuromuscular mechanics	61-86
	Forensic Biomechanics	TBA
	Biomechanics in the Workplace	TBA
May 8	Final - Monday, 1:30 pm.	

THE COLLEGE OF WILLIAM AND MARY
DEPARTMENT OF KINESIOLOGY

Kin 308L, Biomechanics of Human Movement Laboratory

Instructors, Ray McCoy, PhD
Jack Michaels, MS

Spring, 2006

Laboratory Description

The laboratory sessions provide the student with applications in the mechanical analysis of human movement. Fundamental mechanical principles affecting human movement during a variety of daily living and sporting activities are considered.

Date	Lab #	Topic
Jan. 20, 25	1	Anthropometrics
Jan. 27, Feb 1	2	Linear kinematics of walking
Feb. 3, 8	3	Linear and angular kinematics of running
Feb. 17, 22	4	Quantitative video analysis - Data Collection
Feb. 24, Mar 1	5	Quantitative video analysis – Analysis and Results
Mar. 3, 15	6	Quantitative video analysis – Results and Report -- 3D analysis discussion
Mar. 17, 22	7	Ground reaction forces and center of pressure
Mar. 24, 29	8	Center of mass calculations
Mar. 31, Apr. 5	9	Lifting mechanics
Apr. 7, 12	10	Force of the biceps and quadriceps muscle groups
Apr. 14, 19	11	Tissue mechanics
Apr. 21, 26	12	Electromyography fundamentals

All laboratory assignments must be completed to pass the course. Assignments turned in late will be given a 5% deduction per academic day, up to a maximum of 50% of the total score.