

The College of William and Mary
Department of Kinesiology & Health Sciences

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KINE 308, Biomechanics of Human Movement

Spring 2011

Use the Blackboard site for lecture outlines and exam reviews.

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. (2009). Biomechanical Basis of Human Movement. 3rd ed. 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		
19	Introduction Trigonometry review Scalars and vectors	3-25 Appendix B 305-308, 369-371
	Kinematics	
24 26	Linear kinematics Jumping kinematics Projectile motion	301-323 326-331
31	Gait Analysis article	TBA
February		
2 7	Walking kinematics	239-242
9 14	Angular kinematics	337-365
16	Walking and running angular kinematics	355-357
21	Curve fitting and data smoothing	
23	Exam # 1	
	Kinetics	
28	Types of Forces, Laws of Motion	367-375
March		
2	Ground reaction forces during walking, running, and jumping	388-391, 397-401
14	Pressure and Center of Pressure	396-397
	Joint reaction forces	343
	Friction	375-345
	Fluid resistance	346-348
	Inertial force	348
	Muscle force	348-349
	Elastic force	349

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
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April

Types of mechanical analysis, Dynamics	407-410
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Biological Tissue mechanics	9-13, 38-49
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Neuromuscular mechanics	61-86
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Forensic Biomechanics	TBA
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Biomechanics in the Workplace	TBA
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May

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Final - Monday, 9:00 am.

THE COLLEGE OF WILLIAM AND MARY
DEPARTMENT OF KINESIOLOGY & HEALTH SCIENCES

KINE 308L, Biomechanics of Human Movement Laboratory

Instructors, Ray McCoy, PhD
Evie Burnet, PhD

Spring, 2011

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. 21, 26	1	Anthropometrics
Jan 28, Feb 2	2	Linear kinematics of walking
Feb. 4, 9	3	Linear and angular kinematics of running
Feb. 11, 16	4	Quantitative video analysis - Data Collection
Feb 18, 23	5	Quantitative video analysis – Analysis and Results
Feb 25, Mar 2	6	Quantitative video analysis – Results and Report -- 3D analysis discussion
Mar 4, 16	7	Ground reaction forces and center of pressure
Mar. 18, 23	8	Center of mass calculations
Mar. 25, 30	9	Lifting mechanics
Apr. 1, 6	10	Force of the biceps and quadriceps muscle groups
Apr. 8, 13	11	Tissue mechanics
Apr. 15, 20	12	Electromyography fundamentals
Apr. 22, 27	13	Electromyography group project

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.