BIOL 3887 ADVANCED TOPICS IN BIOMECHANICS(3 credit hours)

Elmira College

SPRING 2025

Required Text:

1. Loudon, Janice K(2013), ***Clinical Mechanics and Kinesiology***, Human Kinetics.
2. Stephen J. Thomas; Joseph A. Zeni; David A. Winter(2023), ***Winter's Biomechanics and Motor Control of Human Movement***(5th ed.). Wiley-Blackwell.

Supplemental readings might be included to illustrate or expand on textbook readings.

Pre-requisites: BIOL 1503 Biomechanics

Course Description

This course is a comprehensive course designed to delve deeper into the intricate mechanics of the human body, and is intended for students pursuing advanced studies in kinesiology, sports science, physical therapy, or related fields. It builds upon fundamental biomechanical concepts to provide students with a deeper understanding of how forces, motion, and mechanical principles impact biological systems. Through the course, students will strengthen their critical thinking abilities through the practical application of biomechanical principles to real-world challenges and case studies.

Course Objectives and Goals

- Gain an in-depth understanding of advanced biomechanical concepts, including kinematics, kinetics, anthropometrics, and tissue mechanics.
- Explore the application of biomechanics in sports performance analysis, injury prevention, and optimization of training programs.
- Understand how biomechanics plays a pivotal role in assessing and rehabilitating individuals with musculoskeletal injuries and disorders.
- Examine the biomechanics of muscles, including muscle architecture, force production, and muscle modeling.
- Enhance critical thinking skills by applying biomechanical principles to real-world problems and case studies.

Evaluation of Performance

Your grade will be based upon your performance on exams, assignments, and participation.

Class Participation	10%
Quizzes	20%
Group Projects	30%
Exams	40%
Total	100%

Grades will be assigned as follows:

A	93% and above	B-	80 - 82%	D+	67 - 69%
A-	90 - 92%	C+	77 - 79%	D	63 - 66%
B+	87 - 89%	C	73 - 76%	D-	60 - 62%
B	83 - 86%	C-	70 - 72%	F	59% or below

Withdrawal Policy: Please see Elmira College Bulletin for information on this policy.

Academic Honesty: Please read the section on Academic Honesty in the **Code of Conduct**. Briefly, academic dishonesty includes: cheating, fabrication, facilitating academic dishonesty, and plagiarism. Ask if you have any questions on whether something constitutes as academic dishonesty. All work must be original and new. Past assignments from current or other courses will not be accepted. Academic dishonesty will not be tolerated. It will result in zero on the assignment, and a report will be filed with the school. Continued practice will result in failure of the class. Institutional penalties may also apply with repeated acts of academic honesty.

Student Responsibility:

- It is your responsibility to keep track of assignments and due dates.
- You should ask questions concerning assignments and lectures, if you need any clarifications.
- If you are struggling in class, have concerns, and/or unsure about expectations, please stop by during office hours or make an appointment for another time.

Tentative Schedule of Topics

Topic	Materials	Tasks & Evaluations
Biomechanics As An Interdiscipline	Chapter 1	
Ensemble Averaging Of Repetitive Waveforms	Chapter 2	
Kinematics	Chapter 3	
Muscle and Nerve Physiology	Chapter 4	Quiz 1
Direct Measurement Techniques	Chapter 5	
Anthropometry	Chapter 6	
Biomechanical Models	Chapter 7	
Bone-On-Bone Forces During Dynamic Conditions	Chapter 8	Quiz 2
Mechanical Work, Energy, And Power	Chapter 9	
Power Balances At Joints And Within Segments	Chapter 10	
Problems Based On Kinetic And Kinematic Data	Chapter 11	Exam 1
Basic Muscle and Joint Physiology and Function	Chapter 12	
Muscle and Nerve Physiology	Chapter 13	
Muscle Performance and Function	Chapter 14	Group Project 1
Human Joint Structure and Function	Chapter 15	
Regional Anatomy and Kinesiology	Chapter 16	
Cervical Spine	Chapter 17	
Lumbar Spine and Pelvic Girdle	Chapter 18	Group Project 2
Central Nervous System's Role In Biomechanics	Chapter 19	

Peripheral Nervous System Measurement Techniques	Chapter 20	
Nervous System Role In Muscle Synergies	Chapter 21	Group Project 3
Basic Movements and Clinical Application	Chapter 22	Exam 2