



Course Syllabus: **Advanced Biomechanics**
EXPH 5043-101
Fall 2025, MW 12-1:20pm, Ligon 223
Department of Athletic Training & Exercise Physiology

Contact Information

Instructor: Michael W. Olson, Ph.D.
Email: michael.olson@msutexas.edu
Telephone: 940-397-4053
Office: Ligon Hall 215
Office Hours: M/W: 9:30-10:30 pm; T/TH 9:00 -11:00am
Day and Time: Tuesday/Thursday: 12:00 - 1:20 pm
Location: Ligon 223

Important Dates:

First Day of Class	Tuesday, August 26
Last day to Add	Thursday August 29
Last day for "W"	Monday November 25 (4pm)
Labor day	Monday September 1 (no class)
Exam I	Thursday, October 9 (in class)
Final Exam	Thursday, December 11 (10:30am-12:30pm)

Textbook: There will be no specified text required for the course. Relevant reading materials for each class session will be provided in the form of research articles and selected book chapters through Desire2Learn.

Course Description:

The purpose of this course is to familiarize graduate level students in the application of mechanics to biological systems. The course is intended to further your knowledge of the basic concepts introduced in the undergraduate biomechanics. Quantitative and qualitative analyses of movement will be discussed. Importance will be placed on application of mechanical principles when analyzing basic human movements. Each student will pick a topic of his/her choosing to research and discuss how biomechanical principles influence the biological system.

Course objectives:

There are five objectives to this course:

- Introduction of underlying theories and concepts
- Application of theories and concepts to real-world situations
- Familiarize students with the biomechanics literature
- Provide understanding of the role of biomechanics in everyday life
- Introduce instrumentation and how it is used to measure biomechanical variables

Attendance

Attendance at class is **compulsory** if you intend on performing well in this course. Attendance will be taken each class period. If you are not feeling well, please contact me if you will not be in class. For your wellbeing, and the wellbeing of everyone in the class, it is better that you reduce the spread of microorganisms (germs) and get the notes from a classmate (lectures WILL NOT be recorded).

Student Handbook

Refer to: [Student Handbook-2023-24](#)

Academic Misconduct Policy & Procedures

Academic Dishonesty: Cheating, collusion, and plagiarism (the act of using source material of other persons, either published or unpublished, without following the accepted techniques of crediting, or the submission for credit of work not the individual's to whom credit is given). Additional guidelines on procedures in these matters may be found in the Office of Student Conduct.

Grading

Course Grade - Grades will be based on your performance in the following areas:

Table 1: Percentages allocated to each assignment.

Assignments		%
Exam I	20%	20
Exam II (final)	20%	20
Project	30%	30
Oral Presentation	15%	15
Participation	15%	15
Total		100

Table 2: Total percentages for final grade.

Grade	%
A	90-100
B	80-89.99
C	70-79.99
D	60-69.99
F	< 59.99

Examinations:

There will be two examinations during the semester, a midterm and a final. The format of these examinations will be primarily essay incorporating material from previously presented lectures/discussions. Application questions may also be included to test each student's critical thinking.

Research Project/presentation:

A self-selected, pre-approved topic will be chosen within the first two weeks of the course. A systematic timetable to track the progression of each individual will be enforced to ensure the requirements of the assignment are attained. This timetable includes the selection of a research question or hypothesis, compilation of relevant research articles, and due date for rough drafts. At the end of the semester, students will be allotted 10 minutes to orally present their research topics. There will be a 5 minute time period for questions/answers and group discussion. In general, this project is an assessment of the students' abilities to apply biomechanical concepts.

The format of the project report will include an Introduction, Methods, Results, and Discussion/Conclusion. The Introduction will include a brief literature review/background of the problem, the purpose of the project, and the hypotheses you want answered. The Methods section will include the demographic information of the participants, the instruments used to collect data, and a stepwise process of the procedures performed to collect the data. If statistical analyses are used, they will belong in this section, as well. The Results section is where you will report the findings of your research. Typically, you will structure this based upon the variables you chose to examine. The Discussion section is used to reiterate your purpose and hypotheses, and to write about whether or not the data support or do not support your hypotheses. You will also emphasize a comparison and contrast with the literature.

The length of the report, not including title page and reference page(s), should be 7-8 pages, double spaced, 12 point Times New Roman or Ariel (or similar) font, with 1" (2.54 cm) margins on top and bottom, with 1.25" (3.18 cm) right and left margins.

For the oral presentation you will need to highlight the major points of your project. The presentations will be Power Point slide presentations. Remember, pictures provide more information than words. Inundation of the slide with too many words will overload your audience.

The following rubric will be followed when assessing your presentation and/or paper:

Presentation:

1. Content (30%): is the information valuable to explore
2. Clarity (15%): how well are you presenting the information
3. Competency (40%): are you communicating that you understand and can use the biomechanical terminology applied to the research review
4. Overall Presentation (10%): were the main themes (introduction, systematic presentation, and discussion/conclusion) included in your presentation
5. Slide Show (5%): how well did you prepare the presentation and make use of technology

Report:

1. Background (20%): is the information valuable to explore, supported by the literature
2. Purpose and Hypotheses (20%): do these fit with gaps in the literature
3. Methods/Procedures (20%): how well were the procedures performed for data collection
4. Results (20%): are all data reported appropriately and clearly identified for the reader
5. Discussion (20%): do the data support the hypotheses and how well is the section written to support the findings and how they can be applied

Participation:

The format of the course is a mix of lecture, work with laboratory equipment, and group discussion of the assigned readings and presented materials. It is expected that each person will contribute to the group discussion. The class will meet two times/week during the semester. Thirteen of those weeks will consist of lecture/discussion, one week will be focused on the midterm examination, and the last week will be tailored to your presentations.

Services for Students With Disabilities

In accordance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, Midwestern State University endeavors to make reasonable accommodations to ensure equal opportunity for qualified persons with disabilities to participate in all educational, social, and recreational

programs and activities. After notification of acceptance, students requiring accommodations should make application for such assistance through Disability Support Services, located in the Clark Student Center, Room 168, (940) 397-4140. Current documentation of a disability will be required in order to provide appropriate services, and each request will be individually reviewed. For more details, please go to <http://www.mwsu.edu/student-life/disability>.

College Policies

Campus Carry Rules/Policies

Refer to: [Campus Carry Rules and Policies](#)

Smoking/Tobacco Policy

College policy strictly prohibits the use of tobacco products in any building owned or operated by WATC. Adult students may smoke only in the outside designated-smoking areas at each location.

Alcohol and Drug Policy

To comply with the Drug Free Schools and Communities Act of 1989 and subsequent amendments, students and employees of Midwestern State are informed that strictly enforced policies are in place which prohibits the unlawful possession, use or distribution of any illicit drugs, including alcohol, on university property or as part of any university-sponsored activity. Students and employees are also subject to all applicable legal sanctions under local, state and federal law for any offenses involving illicit drugs on University property or at University-sponsored activities.

Pregnant and Parenting Students

To support the academic success of pregnant and parenting students and students with pregnancy related conditions, the University offers reasonable modifications based on the student's particular needs. Any student who is pregnant or parenting a child up to age 18 or has conditions related to pregnancy, may contact MSU's designated Pregnancy and Parenting Liaison to discuss support available through the University. The Liaison can be reached by emailing ruby.garrett@msutexas.edu or calling 940-397-4500. Should a student communicate with me that they are pregnant or have a pregnancy related condition or may need additional resources related to pregnancy or parenting, I will communicate that student's information to the Title IX Coordinator, who will work with the student and others, as needed, to ensure equal access to the University's education program or activity.

A pregnant student, a parenting student, or a student with pregnancy related conditions may be provided with supportive measures, based on the student's individualized needs, analogous to those provided to a student with a temporary medical condition, and provided such supportive measures do not fundamentally alter the nature of an education program or activity. Such supportive measures may include, but are not limited to:

For pregnant students:

- (1) Providing breaks during class to express breast milk, breastfeed, or attend to health needs associated with pregnancy or related conditions, including eating, drinking, or using the restroom;
- (2) Excusing intermittent absences to attend medical appointments;
- (3) Providing access to online or homebound education, including the providing of access to instructional materials and video recordings of lectures (to the extent such materials, recordings are made available to any student with an excused absence);
- (4) Facilitating changes in schedule or course sequence, including extensions of time for coursework and rescheduling of tests and examinations and/or providing opportunity to make up missed assignments/assessments (such time extensions shall be applied in the same manner as the University grants and provides ADA/504 accommodations for additional time);
- (5) Allowing a student to sit or stand, or carry or keep water nearby;
- (6) Offering counseling;
- (7) Facilitating changes in physical space or supplies (for example, access to a larger desk or a footrest);
- (8) Allowing the student to maintain a safe distance from substances, areas, and activities known to be hazardous to pregnant individuals or unborn children;
- (9) Providing elevator access;
- (10) Facilitating a voluntary leave of absence from the University if the student is in good academic standing at the time the student takes a leave of absence, and facilitating a return to the student's degree or certificate program without being required to reapply for admission if the student remains in good academic standing; or
- (11) Making other necessary changes to policies, practices, or procedures.

For Parenting Students:

- (1) Facilitating priority registration to the extent the University provides early registration for any other group of students; or
- (2) Facilitating a voluntary leave of absence from the University if the student is in good academic standing at the time the student takes a leave of absence, and

facilitating a return to the student's degree or certificate program without being required to reapply for admission.

Obligation to Report Sex Discrimination under State and Federal Law

Midwestern State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. State and federal law require University employees to report sex discrimination and sexual misconduct to the University's Office of Title IX. As a faculty member, I am required to report to the Title IX Coordinator any allegations, personally observed behavior, or other direct or indirect knowledge of conduct that reasonably may constitute sex discrimination or sexual misconduct, which includes sexual assault, sexual harassment, dating violence, or stalking, involving a student or employee. After a report is made, the office of Title IX will reach out to the affected student or employee in an effort to connect such person(s) with resources and options in addressing the allegations made in the report. You are also encouraged to report any incidents to the office of Title IX. You may do so by contacting:

Laura Hetrick
Title IX Coordinator
Sunwatcher Village Clubhouse
940-397-4213
laura.hetrick@msutexas.edu

You may also file an online report 24/7 at
https://cm.maxient.com/reportingform.php?MSUTexas&layout_id=6
Should you wish to visit with someone about your experience in confidence, you may contact the MSU Counseling Center at 940-397-4618. For more information on the University's policy on Title IX or sexual misconduct, please visit
<https://msutexas.edu/titleix/>

Tentative Course Schedule:

Week	Dates	Content	Reading
1	Aug 26-28	Welcome, Introduction, Movement Theory	Hansen et al. (2017) van Oeveren et al. (2021)
2	Sept 2-4	Linear Kinematics	Hamill & Knutzen (Chapter 8)
3	Sept 9-11 Sept 11	Linear Kinematics Lab Equipment (Feliuss et al., 2024) TOPIC APPROVAL DEADLINE	Hamill & Knutzen (Chapter 8)
4	Sept 16-18	Angular Kinematics	Hamill & Knutzen (Chapter 9)

			Postolka et a. (2020)
5	Sept 23-25	Linear Kinetics Newton's Laws SAMPLE OF LITERATURE REVIEW DUE FOR APPROVAL	Kinetics Worksheet, and Hay (Chapter 5)
6	Sept 30 –Oct 2 Oct 2	Linear Kinetics Impulse-Momentum Lab Equipment	Hay (Chapter 5)
7	Oct 7-9	Linear Kinetics (con't) EXAM I	
8	Oct 14-16	Angular Kinetics – Newton's Laws	Hay (Chapter 6) (article TBD)
9	Oct 21-23	Angular Kinetics	Hay (Chapter 6) Griffiths (Chapter 8)
10	Oct 28-30	Work/Energy/Power	Hay (Chapter 5) (article TBD)
11	Nov 4-6	Muscle Mechanics	Van Hooren et al. (2024) Herzog et al. (2003)
12	Nov 11-13	Muscle Mechanics	Kang & Mirka (2023)
13	Nov 18-20 Nov 20	Neuromuscular Control Lab Equipment	Kay et al. (2000)
14	Nov 25	Equilibrium, Balance, Stability	Buurke et al. (2023)
15	Dec 2-4	Student Presentations FINAL DRAFT DUE!!	
16	Dec 11	FINAL EXAM 10:30a-12:30p	

REFERENCES

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