

# BIOE 4200/6200: Sports Engineering – Sec 001

Term: Spring 2024

January 10, 2024 – May 3, 2024

Important Dates:

Jan 15: Martin Luther King Jr. Holiday

Jan 17: Last day to register or add a class

Jan 24: Last day to drop a class or withdraw without a W grade

Mar 15: Last day to drop a class or withdraw without final grades

Mar 18-22: Spring Break

Class Meeting Time and Place:

Mondays, Wednesdays, and Fridays 3:30pm – 4:45pm

Lowry 015

Time to Wait:

If I do not arrive within **15 minutes**, you may assume class is cancelled and are dismissed.

Information on Modality:

This class is fully **in-person** and **synchronous**.

Instructor Name:

Tyler Harvey, PhD

Lecturer of Bioengineering



Instructor Email:

tgharve@clemsn.edu

CLEMSON '14 '16 '18  
ALUMNI

I do my best to respond to email inquiries within 24 hours, excluding weekends and university holidays. If you do not receive a response in this timeframe, feel free to send a polite reminder. For the fastest response, I encourage you to include the course number (BIOE 4200 or 6200) in the subject line of your email.

University Office Phone:

864-565-8616

Office Location:

313 Rhodes Engineering Research Center (Old Rhodes)

If you enter the building on the third floor (next to library bridge), take an immediate right and walk all the way down the hall. You will come to a small kitchen area where the annex begins. My office is directly to the right of this kitchen area, next to the staircase.

### Office Hours:

Office hours are an opportunity for you to further discuss course concepts, ask advising questions about major/concentration choices or your future plans, to get to know me better, or just to discuss life in general.

These can be done in-person or via Zoom by scheduling an appointment online at <http://tgharve.youcanbook.me>

If you choose the Zoom option, a meeting link will be emailed to you automatically. You are also free to stop by my office without an appointment at any other time and I will be happy to meet with you if I'm not otherwise busy.

### Course Description:

Study of engineering principles involved in sports: body systems in human motion, analysis of gait, basic performance patterns in athletic movements, performance improvements, exercise physiology, and the fundamentals of training.

### Prerequisites:

None

### Course Overview:

The purpose of this course is to provide a senior-level introduction to the study of engineering principles involved in sports: body systems in human motion, analysis of gait, basic performance patterns in athletic movements, exercise physiology, performance improvements, and prevention, treatment, and rehabilitation of common sports injuries.

### Learning Objectives:

After completing this course, we will be able to:

1. advance upon the basic understanding of biomechanics, musculoskeletal function, and engineering in order to understand the engineering principles of common sport activities.
2. identify the methods and terminology by which athletes and trainers quantify performance of the body during sport and physical activity.
3. validate the tools used to enhance performance of athletes.
4. identify, formulate and solve engineering problems by applying math, science and engineering tools and knowledge to sports engineering topics.
5. work effectively in teams to address, formulate, design and solve engineering problems related to sports engineering.

## Tentative Topical Outline:

**Note:** This list of topics gives a general idea of when we will cover each topic, but it is subject to change. For the most part, quiz dates are firm, but if they change you will be given at least 1 weeks' notice. Additional in-class activities, field experiences, and guest lectures are still being scheduled for the semester and will be added, which may cause some topics to shift around. For the most up-to-date course schedule, see the Canvas page.

Date	Topic / Module	Assessments
W 1/10	Course Overview and Review	
M 1/15	<b>NO CLASS – MLK DAY</b>	
W 1/17	Modelling, Newton's Laws	
M 1/22	Projectile Motion, Video Capture	
W 1/24	Force Plates	
M 1/29	Impulse-Momentum Relationship	Homework 1
W 1/31	Torque and Center of Mass	
M 2/5	Angular Kinetics	
W 2/7	Power, Work, and Energy	Homework 2
M 2/12		Quiz 1
W 2/14	Friction, Hydrodynamics - Drag	Project 1 (by Friday 2/9)
M 2/19	Hydrodynamics – Propulsion	Homework 3
W 2/21	Collisions, Coefficient of Restitution	
M 2/26	Magnus Effect, Kinetic Chain	Homework 4
W 2/28	Guest Lecture: Dr. Jason Avedesian	
M 3/4		Quiz 2
W 3/6	Muscle Metabolism	
M 3/11	Energy Cost of Movement	
W 3/13	<b>Clemson Baseball Game vs Manhattan (4 pm)</b>	
M 3/18	<b>NO CLASS – SPRING BREAK</b>	
W 3/20	<b>NO CLASS – SPRING BREAK</b>	
M 3/25	<b>Field Trip: Olympic Sports Science</b>	
W 3/27	Cardiovascular Responses to Exercise	Project 2 (by Friday 3/29)
M 4/1	Respiratory Responses to Exercise	
W 4/3	Training (Resistance, Aerobic, Anaerobic)	Homework 5
M 4/8		Quiz 3
W 4/10	BIOE 6200 Guest Lectures	Project 3 (by Friday 4/12)
M 4/15	BIOE 6200 Guest Lectures	
W 4/17	BIOE 6200 Guest Lectures	
M 4/22	BIOE 6200 Guest Lectures	
W 4/24		Quiz 4, Project 4 (by Friday 4/26)

## Assessment & Grading System

Unlike a traditionally graded course, where each assignment is graded out of 100% and weighted according to a set percentage, this course will be assessed using **Specifications Grading**. For each assignment, the specifications to earn a satisfactory grade will be communicated in the assignment

description. If you complete your assignment according to these specifications – you will earn a grade of “Meets Specifications” or MS.

**Does this mean all my work has to be perfect or I will fail the assignment?**

No! Just like work you do at your future job (or in academia/medicine/etc) I expect that you will complete high quality work that is good enough to meet the specifications laid out for the assignment and demonstrate that you can complete the associated learning objective. Generally, this corresponds to a grade of ~80% if the assignment were graded in a traditional course.

**What if I misinterpret the specifications and my work is slightly below that level – do I fail the assignment?**

No! I recognize that you are not yet masters of the course content and might not complete everything correctly on your first attempt. If you put in a decent effort on an assignment and partially meet the specifications of the assignment, but it is not quite perfect you will earn a score of “Needs Revision” or NR. This will usually be accompanied by an explanation of what needs to be improved. An assignment with a grade of NR can always be resubmitted at least once to be reconsidered for a grade of MS – each assignment will have a second due date for it to be reconsidered. Usually this is one-week after grades have been returned, but it depend on the assignment.

**What if I forget about an assignment or completely fail to do it correctly – can I resubmit those to earn a higher grade?**

It depends. An assignment that you do not complete or do very poorly on will usually earn a score of “Incomplete” or IN. In most cases, these scores are final and will not be reconsidered. If you missed the assignment for a legitimate, excusable reason (such as sudden illness, death in the family, your car broke down, etc) you can appeal for an extension to complete the assignment. If you really did put in a lot of effort and just did poorly, you can also meet with me to appeal to a grade of NR, but you should not rely on this.

**What if I’m happy to earn less than an A – do I still have to complete every assignment?**

No! I recognize that you might have a variety of reasons that you’d be happy with a B, C or even a D in this course. Once you complete the requirements to earn a certain grade (detailed in the table below) you have earned that grade and your future work will not decrease it, even if you stop participating completely.

**Why are you grading it this way – what is wrong with traditional grading?**

There is nothing “wrong” with traditional grading, per se. However, in this course as a technical elective I’m more concerned with assessing you in a way that supports your learning by giving you opportunities to fail and learn from your mistakes without worrying about your final grade. I would like you to engage authentically with the content because it interests you and only assign a grade of A if you put in the effort to master its application. On the other hand, I recognize that some of you are not that interested in the content and don’t want to put in the effort to completely master it and are fine doing less work and earning a lower grade. This model of grading gives you the agency to determine what final grade you want to earn and put in the level of effort required to earn it, without being punished if struggle to grasp any of the content.

**If everything is basically graded “Pass/Fail” – how will the final letter grade be determined?**

Each type of assignment is grouped into different categories. The number of assignments you earn of score of MS on will determine your grade for that category. Your final grade will be determined by the lowest score earned in a category. The number of assignments and expectations for each grade is detailed in the table below.

Category	# Of Assignments	Grade Expectations			
		A	B	C	D
Homework Assignments (Application)	5	5/5	4/5	3/5	2/5
Projects (Application)	4	4/4	3/4	2/4	1/4
Quizzes (Theory)	4	4/4	3/4	2/4	
In-Class Assignments (Theory/Practice)	8	6/8	5/8	4/8	3/8
6200 Only Assignments (Communication)	Literature Review	2/2		1/2	
	Guest Lecture				

**Is attendance required?**

Yes. While you will not be assessed on whether you show up or not, there will be 8 in-class assignments scattered throughout the semester. These will be random and not announced in advance – if you are absent when an assignment is done you will earn a score of “Incomplete.” You can only make this up if you provide documentation ahead of time which excuses your absence.

### **Is there a final exam?**

No. All assignments will be completed before the last day of class and there is no final exam. However, if you'd like to resubmit any assignments that earned a score of "Needs Revision" (e.g on Quiz 4) you may need to complete this during finals week.

### **How does the BIOE 6200 version differ from the BIOE 4200 version?**

If you are enrolled in the 6200 version, you must still complete all the requirements of the 4200 version to earn any particular grade. You must also complete some additional requirements in earn a passing grade. Details of these extra requirements can be found at the end of this syllabus.

### **I'm still confused what my final grade will be – can you give some examples of how each different grade is earned?**

#### **Example 1:**

Anna earns a score of "Meets Expectations" on all five homework assignments, all four projects, all four quizzes, and 7 out of 8 in class assignments. Anna's final grade is an A.

#### **Example 2:**

Bob earns a score of "Meets Expectations" on all of the homework and project, but forgets to study for quiz 3 and earns a score of "Incomplete". Even though he earns a "Meets Specifications" on all 8 in-class assignments, his final grade is a B.

#### **Example 3:**

David already has a job lined up after graduation so he doesn't really care about the grade he earns in this class as long as he passes. He only attends enough class to complete 3 in-class assignments, earns a "Meets Expectations" on the first two quizzes, first two homeworks, and first project and decides not to engage with the class after Spring Break. David's final grade is a D.

### **Late Work:**

While you should endeavor to turn all assignments in on time, I recognize that sometimes circumstances arise that makes this a challenge. Therefore, late work (exclusive of quizzes) will be accepted via Canvas or in person up until the point where the assignment has been graded and the score entered to Canvas. Note: if you originally submitted an assignment on-time and earned a score of "Needs Revision" and want to resubmit after improving it, the same policy applies to the resubmission due date.

Beyond this, late work will earn a score of "Incomplete" unless there are extenuating circumstances. Email me if you have a special case that requires turning work in late.

### **Notification of Absence:**

The **Notification of Absence module in Canvas** allows students to quickly notify instructors (via an email) of an absence from class and provides for the following categories: court attendance, death of immediate family member, illness, illness of family member, injury, military duty, religious observance, scheduled surgery, university function, unscheduled hospitalization, other anticipated absence, or other unanticipated absence.

The notification form requires a brief explanation, dates and times. Based on the dates and times indicated, instructors are automatically selected, but students may decide which instructors will receive the notification. This does not serve as an “excuse” from class. It is a request for an excused absence and students are encouraged to discuss the absence with instructors, as the instructor is the only person who can excuse an absence. If students are unable to report the absence by computer, they may reach the Office of Advocacy and Success. Students with excessive absences who need academic or medical assistance can also contact the Office of Advocacy and Success.

## Academic Integrity

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.

All infractions of academic dishonesty by undergraduates must be reported to Undergraduate Studies for resolution through that office. In cases of plagiarism instructors may use the Plagiarism Resolution Form.

See the [Undergraduate Academic Integrity Policy](#) website for additional information and [the current catalogue](#) for the policy. For graduate students, see the current [Graduate School Handbook](#) for all policies and procedures.

## Accessibility

Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to this class should let the instructor know and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848, by emailing [studentaccess@lists.clemson.edu](mailto:studentaccess@lists.clemson.edu), or by visiting Suite 239 in the Academic Success Center building. Appointments are strongly encouraged – drop-ins will be seen, if at all possible, but there could be a significant wait due to scheduled appointments. Students who have accommodations are strongly encouraged to request, obtain and send these to their instructors [through the AIM portal](#) as early in the semester as possible so that accommodations can be made in a timely manner. It is the student's responsibility to follow this process each semester.

You can access further information at the [Student Accessibility website](#). Other information is at the university's [Accessibility Portal](#).

## The Clemson University Title IX Statement Regarding Non-Discrimination

The Clemson University Title IX statement: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This Title IX policy is located on the Campus Life website. Ms. Alesia Smith is the Clemson University Title IX Coordinator, and the Executive Director of Equity Compliance. Her office is located at 223 Brackett Hall, 864-656-0620. Remember, email is not a fully secured method of communication and should not be used to discuss Title IX issues.

*Clemson University aspires to create a diverse community that welcomes people of different races, cultures, ages, genders, sexual orientation, religions, socioeconomic levels, political perspectives, abilities, opinions, values and experiences.*

## Emergency Preparation

Emergency procedures have been posted in all buildings and on all elevators. Students should be reminded to review these procedures for their own safety. All students and employees should be familiar with guidelines from the Clemson University Police Department. [Visit here for information about safety.](#)

Clemson University is committed to providing a safe campus environment for students, faculty, staff, and visitors. As members of the community, we encourage you to take the following actions to be better prepared in case of an emergency:

1. Ensure you are signed up for [emergency alerts](#)
2. Download the [Rave Guardian app](#) to your phone (<https://www.clemson.edu/cusafety/cupd/rave-guardian/>)
3. Learn what you can do to [prepare yourself](#) in the event of an active threat (<http://www.clemson.edu/cusafety/EmergencyManagement/>)



## **BIOE 6200 Written / Oral Project Details**

Paper Length: 8-12 pages double spaced

Due: Sunday, April 21st by 11:59pm

Presentation Time: 20-25 minutes

Due: In class April 10th-22nd (Schedule to be determined)

Choose any sports injury and perform a comprehensive literature review, consisting of at least 10 peer-reviewed sources. The content must include the topics and various specific requirements as listed below.

After completing your literature review, prepare a 20-25 minute guest lecture to give to the rest of the class during the final week of class which gives a complete overview of the injury you've chosen. These lectures will be treated as normal class content and all material will be included on the last quiz.

Topics must be approved (via email or Canvas). Each student must cover a different topic and topics will be approved on a first-come basis.

### **List of Topics to Cover in Literature Review:**

#### **Physiology**

Composition (cells/matrix), structure, and function of native tissue and how they are related, normal biomechanics or physiology of the body, etc

#### **Pathology**

Mechanisms of injury / disease-how does injury / disease alter structure and resulting function-what are the consequences of the pathological state

#### **Prevention**

Current standard(s) of training for prevention of the injury, emerging research or techniques

#### **Treatment**

Current standard(s) of medical treatment of the injury, including medical device interventions, surgical approaches, pharmaceutical therapies, etc, emerging research or techniques to aid in treatment

#### **Rehabilitation**

Current standard(s) of post-treatment rehabilitation or therapy to recover from the injury and return to sport, potential chronic or long-term complications, etc