

Acknowledgement of Indigenous Peoples and Traditional Territories: York University recognizes that many Indigenous nations have longstanding relationships with the territories upon which our campuses are located that precede the establishment of York University. We acknowledge our presence on the traditional territories of the Mississaugas of Credit First Nation, the Huron-Wendat, the Haudenosaunee Confederacy and the Métis Nation of Ontario

**York University**  
**Faculty of Health**  
**SCHOOL OF KINESIOLOGY AND HEALTH SCIENCE**

**Course:** HH/KINE 3030 3.0 Introduction to Biomechanical Analysis of Human Movement **Course Webpage:**

[Course: HH/KINE3030 M & N - Biomechanics of Human Movement \(Winter 2023-2024\) | eClass \(yorku.ca\)](#)

**Course Email:** biomech@yorku.ca

**Term:** Winter 2024

**Prerequisite / Co-requisite:** HH/KINE 2031 3.00 Human Anatomy

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**Course Director:** Dr. Anne Moore, Contact through course email

TA lab schedule and contact information is available on eClass

**Time and Location**

Lectures      Section M: 8:30-9:45    T LAS A  
                    Section N: 10:00-11:15 T ACW 109  
Labs            as scheduled in CB 162

Office Hours: Weekly through zoom (Thursday 11:00-12:00 unless change noted in eclass)

Thursday classes moved from CLH L to synchronous zoom tutorial and asynchronous lecture recordings. Zoom link will be posted on eclass

**PLEASE NOTE: In the event a classroom becomes available for both sections on Thursdays later in the term, we may return to live lectures/tutorials on Thursdays.**

**Course Description and Organization**

Human Movement will be investigated with reference to the laws of physics (mechanics) and anatomical concepts applied to joint motion and muscular action.

The course involves 2 classes per week (Tuesday in person, Thursday on zoom). The first part of the Tuesday's class will be lecture in format. The live lectures will not be directly recorded but lecture recordings will be available on eclass covering the lecture portion of the class. The second part of Tuesday's class will be tutorial format and include questions using iclicker (also used for attendance grade).

You will be directed to the required lecture recording for the lecture portion of Thursday's class. We will then meet for 30 minutes on zoom (section M 9:15, section N 10:00), review the concepts, and practice the material using a tutorial format .

The lectures are supplemented by required readings and practice questions from the textbook as well as required quizzes on McGraw Hill Connect. The link for Connect can be found on eclass. Any questions on the material taught can be asked of the professor during the tutorial sessions. The concepts taught are practiced in a laboratory component. This is an applied course and the

purpose of the practice questions and laboratory component is for students to develop a clearer understanding of how an understanding of biomechanics can help them work in various fields involving human movement.

A lecture schedule (including labs and readings) is provided on eClass. It is important to keep to the timeline provided as the material builds on itself and later parts of the course expect that you have mastered earlier parts of the course.

## **Course Objectives**

1. To develop an understanding that all human movement (normal gait, pathological gait, sport, dance, occupational tasks etc.) takes place within a framework of known mechanical principles interacting with human anatomy and muscle physiology.
2. To learn and be able to apply a basic and valid framework of the mechanics of human motion. This includes calculating *and interpreting* basic kinematic and kinetic measures used to describe human motion.
3. To understand and communicate the relevance and usefulness of these principles as applied to different aspects of human movement (health, sport, work etc.).

## **Specific learning outcomes**

- To be able to describe and calculate human movement in an anatomical and mechanical framework including linear and angular measures of position, velocity, and acceleration
- To identify and analyse the common internal and external forces acting on a human during movement
- To apply the theory of how muscles work in a mechanical system as a cause of motion to determine which muscle would be acting during slow exercises and calculate how much muscle force or torque would be required
- To apply theory of angular momentum and projectile motion to predict what would happen while a human is in the air
- To apply concepts of equilibrium and centre of gravity to maintaining stability.

## Grading, Assignment Submission, Late Penalties and Missed Tests

### Evaluation

- 20% Midterm Exam #1 **Tuesday February 6, 2024** (Make up Friday February 16, 2024)
- 20% Midterm Exam # 2 **Tuesday March 12, 2024** (Make up Friday March 22, 2024)
- 8% Laboratories: 8 submitted for grading @1% each
- 5% McGraw Hill Connect quizzes
- 7% Class Tutorial Attendance (through iclicker 1 mark/class for any 7 of 9 Tuesday lectures - lecture 1 for trial only)
- 40% Final Exam: during final exam period (3 hours) (deferred exam will be written in late May - please note students who have applied to graduate and write the deferred exam may not receive their grades in time to graduate).

Notes: All tests/exams are cumulative. This course builds on itself!

All tests are in person, no online tests/exams will be held in this course.

All tests/exams are closed book, no course materials are allowed in the exam. For the final exam an equation sheet will be provided attached to the exam (details will be given on eclass).

### Grading Scheme:

The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York (e.g., A+ = 9, A = 8, B+ = 7, C+ = 5, etc.).

For a full description of York grading system see the York University Undergraduate Calendar - [Grades and Grading Schemes | Academic Calendars | York University](#)

Final course grades may be adjusted to conform to Program or Faculty grades distribution profiles.

### Test Viewing:

One supervised test viewing will be scheduled after each test for learning purposes. No phones/other means of notetaking/capturing will be allowed in test viewings.

Any appeal for grade revision, (a) must be received by the instructor WITHIN 7 CALENDAR DAYS of the date of the exam viewing, (b) must be MADE IN WRITING, and (c) must EXPLICITLY STATE why the student believes the grade is in error. Grade disputes after this 7-calendar day period will not be considered.

### Missed Tests:

If you miss a midterm you may write the deferred test on the dates indicated above. **No supporting documentation is required.** If you miss the deferred test the weight of a missed midterm will be added to the final. If you miss the final exam an exam deferral form is required and is submitted on eclass.

## COURSE TEXT / READINGS

Textbook: Hall, S. Basic Biomechanics, 9th Edition with Connect (details on how to use and purchase on eclass under “Connect (textbook) information and links”)

Also available on eClass: Course Outline, Lab instructions, lecture recordings, lecture slides

### Technical requirements for taking the course:

Three platforms will be used, (i.e., eClass, iClicker and Zoom), through which students will interact with the course materials, the course directors, Teaching Assistants, as well as with one another. iClicker Student is a mobile app which can be downloaded and used for free by York students. If a student does not have a mobile device to use iClicker in class, they may submit answers/participation by paper during class time (please note: identification may be required).

### Useful links describing computing information, resources and help for students:

|  |   |
|--|---|
| <u>Student Guide to eClass</u>                       | <a href="#">Student Guide to eClass - Learning Technology Services (yorku.ca)</a>   |
| <u>Computing for Students Website</u>                | <a href="https://student.computing.yorku.ca/">https://student.computing.yorku.ca/</a>   |
| <u>Student Guide to eLearning at York University</u> | <a href="http://elearning-guide.apps01.yorku.ca/">http://elearning-guide.apps01.yorku.ca/</a>   |
| <u>Learning Skills Services</u>                      | <a href="#">Learning Skills Services - Student Community &amp; Leadership Development (yorku.ca)</a>  |
| <u>Zoom@YorkU User Reference Guide</u>               | <a href="http://staff.computing.yorku.ca/wp-content/uploads/sites/3/2012/02/Zoom@YorkU-User-Reference-Guide.pdf">http://staff.computing.yorku.ca/wp-content/uploads/sites/3/2012/02/Zoom@YorkU-User-Reference-Guide.pdf</a> |
| <u>Zoom@YorkU Best Practices</u>                     | <a href="https://staff.computing.yorku.ca/wp-content/uploads/sites/3/2020/03/Zoom@YorkU-Best-Practicesv2.pdf">https://staff.computing.yorku.ca/wp-content/uploads/sites/3/2020/03/Zoom@YorkU-Best-Practicesv2.pdf</a>       |

Students shall note the following:

- Zoom is hosted on servers in the U.S. This includes recordings done through Zoom.
- If you have privacy concerns about your data, provide only your first name or a nickname when you join a session.
- The system is configured in a way that all participants are automatically notified when a session is being recorded. In other words, a session cannot be recorded without you knowing about it.

## **Labs and Lab Assignments:**

- The purpose of the labs is to provide the student with a 'hands-on' application of the major theories discussed during lecture.
- Attendance in your scheduled lab is expected.
- Your lab assignment are submitted on-line on eclass on or before the day it is due (1 week following your lab).
- If you do not hand in your lab assignment, your assignment WILL NOT be marked and you will receive a mark of zero (0); if you hand in your assignment late, you will lose 50% if it is handed in during the first week that it is late, and 100% after that, i.e., you have one week to hand in late assignments or you will receive a mark of zero (0).
- Exceptions to the lateness penalty for valid reasons such as illness, compassionate grounds, etc., may be considered by the Course Instructor and may require supporting documentation. Requests must be submitted within a week of your scheduled lab and must be copied to your TA
- Eight lab assignments will be handed in and are worth 1% each of your FINAL GRADE; you are strongly encouraged to complete all of the lab assignments and to hand them in on time on eclass; in total, the lab assignments account for 8% of your final grade
- Your TA's name can be found on eClassAll students are required to take the laboratory, there is no exception for people who previously have taken the course.

## **Academic Honesty and Integrity:**

Students are expected to maintain the highest standards of academic integrity related to issues such as cheating, enabling cheating, plagiarism, authentic documentation, etc. Breaches of academic integrity will not be tolerated.

The School of Kinesiology and Health Science takes academic dishonesty very seriously and will abide by York University's Senate Policy of Academic Honesty to adjudicate all cases. Students are expected to make efforts to discourage any and all (un)intentional breaches from their course work. Students are expected to complete their own work without assistance, in part or whole, on assignments and tests. Students are expected to act in accordance with the Senate Policy of Academic Honesty and are responsible for familiarizing themselves with these guidelines. Breaches of academic integrity will be handled under the disciplinary proceedings as outlined in: <https://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/>.

To familiarize yourself with the meaning of academic integrity by completing SPARK's [Academic Integrity module](#) at the beginning of the course. Breaches of academic integrity range from cheating (i.e., the improper crediting of another's work, the representation of another's ideas as your own, etc.) to aiding and abetting (helping someone else to cheat). All breaches in this course will be reported to the appropriate university authorities, and can be punishable according to the [Senate Policy on Academic Honesty](#).

**Intellectual Property Notice:** *These course materials (course lecture recordings, lecture notes, quiz and labs) are designed for use as part of the (HH/KINE 3030) course at York University and are the intellectual property of the instructor unless otherwise stated. Third party copyrighted materials (such as book chapters, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law.*

*Copying this material for distribution (e.g. uploading material to a commercial third-party website) may lead to a charge of misconduct under York's [Code of Student Rights and Responsibilities](#) and the Senate Policy on [Academic Honesty](#) and/or legal consequences for violation of copyright law if copyright law has been violated.*

## **Student Code of Conduct:**

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect and to refrain from actions disruptive to such a relationship. Moreover, it is the responsibility of the instructor to maintain an appropriate academic environment, and the responsibility of the student to cooperate in that endeavour. Students must conduct themselves in accordance with York University's Student Code of Conduct. This includes all aspects of the course, including online environments. A statement of the policy and procedures involving disruptive and/or harassing behaviour by students in academic situations is available at: <https://oscr.students.yorku.ca/student-conduct>.

## **Student Code of Rights and Responsibilities:**

This code is intended to be educative and promote accountability among students toward their peers and other members of the York community. This code identifies those behaviours that are disruptive to the educational purposes of the University, make the campus less safe, diminish the dignity of individuals and groups, and the enjoyment of their rights. It applies specifically to students because the behaviours of non-student members of the University community are held to comparable standards of account by provincial laws, University policies, and their unions' collective agreements. Information about how to address a concern or a complaint regarding a faculty or staff member can

be found at: <http://oscr.students.yorku.ca/>.

**Test Banks:**

The offering for sale of, buying of, and attempting to sell or buy test banks (banks of test questions and/or answers), or any course specific test questions/answers is not permitted in the Faculty of Health. Any student found to be doing this may be considered to have breached the Senate Policy on Academic Honesty. In particular, buying and attempting to sell banks of test questions and/or answers may be considered as “Cheating in an attempt to gain an improper advantage in an academic evaluation” (article 2.1.1 from the Senate Policy) and/or “encouraging, enabling or causing others” (article 2.1.10 from the Senate Policy) to cheat.



### **Accessibility:**

York University provides services for students with accessibility concerns (including physical, medical, learning, and psychiatric), who require accommodation related to teaching and evaluation methods/materials. It is the student's responsibility to register with Student Accessibility Services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to email a copy of your accommodation letter to your instructors as early as possible in the semester, and to schedule a time early in the term to meet with your instructor to discuss your accommodation needs. Failure to make these arrangements may jeopardize your opportunity to receive academic accommodations. Requiring accommodation does not relieve students from following course policies. Student Accessibility Services can be accessed here: <https://accessibility.students.yorku.ca/>. If your accommodation includes writing in the altexam centre, be sure to schedule your tests and exams as soon as possible.

### **Take Care of Yourself:**

We all face stressors and anxiety in our lives, both academic and otherwise. Please be kind and gentle with yourselves and others. There are a number of online free resources available to help support you. If you need help, the following list of websites (this is not an exhaustive list) may be a good place for you to start:

<https://good2talk.ca/>

<https://counselling.students.yorku.ca/>

<https://yorkinternational.yorku.ca/>

### **Other Resources**

Library Help: If you having trouble with library content, please go to the York Library website and click on "Chat Is Online", <https://www.library.yorku.ca/web/>.

Learning Commons: Your York home for study help and workshops, <http://learningcommons.yorku.ca/>.

### **Calumet and Stong Colleges' Student Success Programming:**

[Calumet](#) and [Stong](#) Colleges aim to support the success of Faculty of Health students through a variety of **free programs** throughout their university career:

- [Orientation](#) helps new students transition into university, discover campus resources, and establish social and academic networks.
- [Peer Mentoring](#) connects well-trained upper-year students with first year and transfer students to help them transition into university.
- [Course Representative Program](#) aims to build the leadership skills of its Course Reps while contributing to the academic success and resourcefulness of students in core program classes.
- [Peer-Assisted Study Session \(P.A.S.S.\)](#) involve upper-level academically successful and well-trained students who facilitate study sessions in courses that are known to be historically challenging.
- [Peer Tutoring](#) offers one-on-one academic support by trained Peer Tutors.
- Calumet and Stong Colleges also support students' [Health & Wellness](#), [leadership and professional skills development](#), [student/community engagement and wellbeing](#), [career exploration](#), [Indigenous Circle](#), [awards and recognition](#), and [provide opportunities to students to work or volunteer](#).

- Please connect with your Course Director about any specific academic resources for this class.
- For additional resources/information about our student success programs, please consult our websites ([Calumet College](#); [Stong College](#)), email [scchelp@yorku.ca](mailto:scchelp@yorku.ca), and/or follow us on Instagram ([Calumet College](#); [Stong College](#)), Facebook ([Calumet College](#); [Stong College](#)) and [LinkedIn](#)
- Are you receiving our weekly email (Calumet and Stong Colleges - Upcoming evens)? If not, please check your Inbox and Junk folders. If you do not find our weekly emails, then please add your 'preferred email' to your Passport York personal profile. If you need support, please contact [ccscadm@yorku.ca](mailto:ccscadm@yorku.ca), and request to be added to the listerv.

**Lecture Schedule:**

| <b>Week</b>       | <b>Video #</b> | <b>Topic</b>  | <b>Readings</b>  | <b>Lab</b>                   |
|-------------------|----------------|---|------------------|------------------------------|
| January 8, 2024   | 1              | What is biomechanics?                                 | Ch. 1            |                              |
|                   | 2              | Kinematics Foundation                                 | Ch. 2            |                              |
| January 15, 2024  | 3              | Kinetic Foundation **                                 | Ch. 3            | Kinematic foundation         |
|                   | 4              | Linear Kinematics ***                                 | Ch. 10 (293-304) |                              |
| January 22, 2024  | 5              | Projectile Motion **                                  | Ch. 10 (305-320) | Projectile Motion*           |
|                   | 6              | Angular Kinematics I (relative vs absolute) ***       | Ch. 11 (327-331) |                              |
| January 29, 2024  | 7              | Angular Kinematics II (angular kinematic measures) ** | Ch. 11 (332-341) | Angular measurement*         |
|                   | 8              | Relationship Between Angular and Linear Motion ***    | Ch 11 (341-347)  |                              |
| February 5, 2024  | Tues. Feb 6    | Midterm 1   | Ch. 6 (133-158)  | Linear/angular relationship* |
|                   | 9              | Biomechanics of Human Skeletal Muscle Part 1 ***      |                  |                              |
| February 12, 2024 | 10             | Biomechanics of Human Skeletal Muscle Part 2 **       |                  | Gait mat*                    |
|                   | 11             | Newton's Laws ***                                     | Ch. 12 (355-358) |                              |
| February 26, 2024 | 12             | Free Body Diagrams and common Forces **               |                  | Muscle*                      |
|                   | 13             | Friction and Ground Reaction Forces ***               | Ch. 12 (359-365) |                              |
| March 4, 2024     | 14             | Torque and Mechanical Action of Muscles **            | Ch. 13 (387-411) | Friction/GRF*                |
|                   | 15             | Gravity and Centre of Gravity ***                     | Ch. 13 (403-408) |                              |
| March 11, 2024    | Tues. Mar 12   | Midterm 2   | Ch. 13 (398-403) | Centre of Gravity*           |
|                   | 16             | Static Equilibrium: Whole Body Motion ***             |                  |                              |

|                   |    |                                      |   |                      |
|-------------------|----|--------------------------------------|---|----------------------|
| March 18,<br>2024 | 17 | Static Equilibrium:<br>Joint Level** |   |                      |
|                   | 18 | Stability and<br>Balance***          | Ch. 13 (408-<br>411) ch 12<br>(374-375) | Lift (Joint torque)* |
| March 25,<br>2024 | 19 | Moment of Inertia**                  | Ch. 14 (419-<br>424)                    | Angular<br>Momentum  |
|                   | 20 | Linear and Angular<br>Momentum***    | Ch 14 (424-<br>433) Ch 12<br>(365-369)  |                      |
| April 1, 2024     | 21 | Centripetal<br>Acceleration**        | Ch 14 (435-<br>437)                     |                      |
|                   | 22 | Zoom review                          |   |                      |

\*Labs to be submitted

\*\*Lectures with 1 mark attendance available through iclicker (max 7 of 9 lectures, 7 marks)

\*\*\*Thursday lecture topic recordings to be viewed asynchronously. Material will be reviewed and practiced tutorial style synchronously on zoom during class time. In the event classrooms become available later in the term, Thursdays may revert to in person lecture/tutorial

## Appendix B IMPORTANT COURSE INFORMATION FOR STUDENTS

York University seeks to provide for equal rights and opportunities without discrimination for all students. The overall aim is a climate of understanding and mutual respect for the dignity and worth of each community member so that each person feels a part of York University and is able to fully participate in university life.

The following information describes some of your important rights and responsibilities as students, along with the supports, accommodations and services made available to you by York.

**Academic Honesty and Integrity.** York students are required to maintain the highest standards of academic honesty and they are subject to the *Senate Policy on Academic Honesty* ([secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/](https://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/)). The Policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards. Comprehensive information about academic honesty, along with information about how to find resources at York to help improve your research and writing skills and cope with University life, can be found at: [www.yorku.ca/academicintegrity/](http://www.yorku.ca/academicintegrity/)

**Conduct in Academic Situations.** Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. It is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class in keeping with the *Senate Policy and Procedures on Disruptive and/or Harassing Behaviour in Academic Situations* ([secretariat-policies.info.yorku.ca/policies/disruptive-andor-harassing-behaviour-in-academic-situations-senate-policy/](https://secretariat-policies.info.yorku.ca/policies/disruptive-andor-harassing-behaviour-in-academic-situations-senate-policy/)).

**Ethics Review Process.** York students are subject to the York University *Policy for the Ethics Review Process for Research Involving Human Participants* ([secretariat-policies.info.yorku.ca/policies/ethics-review-process-for-research-involving-human-participants-policy/](https://secretariat-policies.info.yorku.ca/policies/ethics-review-process-for-research-involving-human-participants-policy/)). Ethics approval must be obtained prior to the starting any research activities involving human participants, including research conducted by students in a graduate or undergraduate course, for an undergraduate thesis or project, or for a Major Research Paper, Thesis or Dissertation. If you are in doubt as to whether this requirement applies to you, contact your Course Director immediately. More information can be found at: [www.yorku.ca/research/human-participants/](http://www.yorku.ca/research/human-participants/)

**Religious Accommodation.** York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents. Should any of the dates specified in your course syllabus pose such a conflict for you, contact the Course Director within 14 days of the date for which

accommodation is sought. Other procedures are outlined in the York University policy, guidelines and procedures on *Academic Accommodation for Students' Religious Observances* ([secretariat-policies.info.yorku.ca/policies/academic-accommodation-for-students-religious-observances-policy-guidelines-and-procedures/](https://secretariat-policies.info.yorku.ca/policies/academic-accommodation-for-students-religious-observances-policy-guidelines-and-procedures/)). Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete an Religious Accommodation Agreement, which can be found at: [registrar.yorku.ca/pdf/exam-accommodation.pdf](https://registrar.yorku.ca/pdf/exam-accommodation.pdf)

**Accessibility Services.** Student Accessibility Services ([accessibility.students.yorku.ca/](https://accessibility.students.yorku.ca/)) provides academic accommodations and supports for students with temporary and permanent disability including physical, sensory, medial, learning, and mental health disabilities. Students who had an Individualized Education Plan (IEP) in high school are eligible for support. Please note that registering with disabilities services and discussing your needs with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs.

**Academic Skills Support.** York University Libraries ([www.library.yorku.ca](https://www.library.yorku.ca)) and the Learning Commons ([learningcommons.yorku.ca/](https://learningcommons.yorku.ca/)) provide students with academic support for their course assignments and research requirements. The Libraries offer an array of supports, services, workshops, resources and people available to help ensure continued success during a student's academic career.

**Centre for Human Rights, Equity, and Inclusion.** The Centre for Human Rights, Equity and Inclusion ([rights.info.yorku.ca/](https://rights.info.yorku.ca/)) facilitates confidential processes to discuss allegations of discrimination and harassment by York Community members. There are also robust training opportunities and workshops available to the community year round.

**Counselling, Health and Well Being.** Student Counselling, Health & Well Being ([counselling.students.yorku.ca](https://counselling.students.yorku.ca)) supports students in realizing and developing their personal potential in order to maximally benefit from their university experience and manage the challenges of university life. Services include: peer-led workshops, certificate training programs, support groups, same-day and appointment-based counselling, short-term therapy, and more.

**Sexual Violence Response and Support.** The Centre for Sexual Violence Response, Support and Education ([thecentre.yorku.ca](https://thecentre.yorku.ca)) facilitates support, services and accommodations for those who have experienced sexual violence. The support offered is based on the needs and wishes of the person disclosing/reporting.

**Student Community Relations.** The Office of Student Community Relations ([oscr.students.yorku.ca/](https://oscr.students.yorku.ca/)) supports students impacted by critical incidents, facing personal crises or multiple complex issues, such as, but not limited to, critical illness or injury of a student, student death, attempted suicide and sexual assault. OSCR provides advice, referrals, alternate dispute resolution methods and judicial processes (local adjudication, tribunals).