

**SPORT SCIENCE & MANAGEMENT  
SS2102 INTRODUCTION TO SPORT BIOMECHANICS**

<b>Pre-requisites</b>	None required
<b>No of AUs</b>	3
<b>Contact Hours</b>	Total hours: 39

**Course Aims**

Biomechanics is the study of a biological system by means of mechanics. This course introduces basic mechanical concepts, biomechanics laboratory equipment and software to evaluate human movements. In this course, you will be able to relate the basic mechanical concepts introduced to the principles that govern human movements. To link theory and practice of the biomechanical concepts, this course will also present qualitative and quantitative analyses of sport skills.

**Intended Learning Outcomes (ILO)**

By the end of the course, you should be able to:

1. Explain basic mechanical concepts introduced in the course.
2. Relate the basic human movements with the mechanical concepts
3. Perform qualitative and quantitative analyse of selected motor skills.
4. Use basic biomechanical laboratory equipment and software to evaluate human movement.
5. Apply course content in a practical setting to facilitate training, enhance performance and minimize the risk of injuries.

**Course Content**

The following topics will be covered:

1. Linear kinematics – basic concepts
2. Linear kinematics - projectile motion
3. Angular kinematics
4. Relating linear and angular kinematics
5. Kinematic video analysis
6. Linear kinetics – Newton's Laws
7. Linear kinetics – mechanical properties of bodies in contact
8. Principle of Equilibrium
9. Angular kinetics
10. Fluid mechanics

**Assessment (includes both continuous and summative assessment)**

Component	Course ILO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/ Individual	Assessment rubrics
1. Group Presentation	1,2, 3, 4, 5	A1, A3, C1, C2,D1	20%	Team	Appendix 1
2. Individual Assignment	1-5	A1, A2, A3, B1, B2, B3, C1	20%	Individual	
3. Examination	1-5	A1, A2, B1	60%	Individual	
Total			100%		

Graduates of the SSM programme should show:

**Competence**

A1: {Understanding}

process and interpret information, evidence and methodologies related to sport science or sport management

A2: {Self-discipline}

independently apply themselves to solve relevant problems

A3: {Modern Tool Usage}

use technology to communicate and provide feedback on sports activities, improve sports performance, monitor and increase physical activity, provide exercise prescription, solve problems for disadvantaged athletes/sportspeople, and commercialize and innovate sports products, events and services

**Creativity**

B1: {Critical Thinking}

critically assess the applicability of sport science and sport management tools toward problems and in the workplace

B2: {Analytical Thinking}

critically analyse data from a multitude of sources

B3: {Interdisciplinary Thinking}

connect the subfields of sport science and sport management to tackle problems

B4: {Innovation}

be able to develop new applications or improve existing techniques

B5: {Entrepreneurship}

develop new ideas and plans for sport science, businesses and events

<b>Communication</b>	
C1: {Effective Communication}	present findings or ideas from sport science and sport management research logically and coherently at the appropriate level for the intended audience and in all forms of communication
C2: {Teamwork}	work in teams on projects that require sport science or sport management application, and communicate results via demonstration, verbally and in written form
<b>Civic-Mindedness</b>	
D1: {Professionalism}	act in a manner that respects the profession and meets the expectations of the sport science and sport management industry
D2: {Inclusiveness}	promote sport and physical activity in all individuals to bring people together and improve physical, social and psychological outcomes
<b>Character</b>	
E1: {Ethical behaviour}	act with integrity and in a socially responsible and ethical manner in line with societal and legal expectations in relation to collecting and analysing data of people and protecting personal data with appropriate computer security
E2: {Sportspersonship}	demonstrate appropriate safety, concern and good conduct in sport situations towards other individuals involved in the activity
<b>Formative feedback</b>	
<p>Feedback for learning will be verbal provided during each laboratory class session where you have the opportunity to learn techniques and apply yourselves to problems related to each organ system.</p> <p>Instructor of the course will be available for an hour of consultation on weekly basis. However, appointments for such consultations need to be pre-arranged.</p> <p>During the completion of the Group Presentation, as a group, you will be provided with verbal feedback pertaining to your assessed performance. Generic verbal and written feedback will be provided to the class for the test and examination.</p> <p>Throughout the course, you will have opportunity to use recording devices (e.g, Video) to help record your fellow classmates demonstrating movements for observation and analysis. During the learning process, you will receive verbal feedback on the techniques and mistakes in observation and analysis. Suggestions for improvement will be provided.</p>	

## Learning and Teaching approach

Approach	How does this approach support you in achieving the learning outcomes?
Lectures	Lectures will provide information for key learning concepts and theories and support understanding of key concepts
Laboratories	Laboratories will: <ul style="list-style-type: none"><li>- Give hands-on experiential learning to support key theories and information provided in class</li><li>- Provide tasks for you to utilise what they recently learned to solve specific problems.</li><li>- Give space and time for small group activities and discussions to allow you to assimilate the content and for sharing learning</li><li>- Allow opportunity for verbal feedback from instructor to you on techniques and material.</li></ul>
Online learning	Time will be given for learning from online materials as a part of flip teaching approach. These materials will support key concepts covered in lectures and laboratories.

## Reading and References

Hall, S.J. (2019). *Basic Biomechanics* (8<sup>th</sup> Ed.). McGraw-Hill Education. (core text)

## Course Policies and Student Responsibilities

### (1) General

You are expected to complete all assigned pre-class readings and activities, attend all classes – lecture and laboratory - punctually and submit all scheduled assignments and take tests by due dates. You are not allowed to swap laboratory groups without express permission from the course coordinator. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for sessions they have missed. You are expected to participate in all discussions and class activities unless there is a valid medical reason not to do so.

### (2) Absenteeism

Absence from class without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

If you miss a lecture, you must inform the course instructor via email prior to the start of the class.

### (3) Absence Due to Medical or Other Reasons

If you are sick and not able to complete a test or submit an assignment, you have to submit the original Medical Certificate (or another relevant document) to the Sport Science & Management (or Home School) administration to obtain official leave. Without this, the

missed assessment component will not be counted towards the final grade. There are no make-ups allowed.

#### (4) Attire and safety

You are expected to participate in practical laboratory activities. Some of these activities involve exercise. All of you are expected to wear appropriate attire for participation, obey laboratory safety rules, and take appropriate care of and return all equipment after use.

### Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Collaboration is encouraged for your work in the class and laboratories because peer-to-peer learning helps you understand the subject better and working in a team trains you to better communicate with others. Working together and exchanging ideas and experiences will help improve the quality of your assessed presentation. It is important to credit others for their contribution to your work which promotes ethical practices and academic integrity.

### Course Instructors

Instructor	Office Location	Phone	Email

### Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Introduction to Biomechanics	LO1, LO2, LO3, LO5	Chapter 1,2 &3 Pages 02-81
2	Linear kinematics - terminology	LO1, LO2, LO5	Chapter 10, Pages 310-320
3	Linear kinematics - projectile motion	LO1, LO2, LO5	Chapter 10, Pages 321-339
4	Angular kinematics	LO1, LO2, LO5,	Chapter 11, Pages 345-359
5	Relationship between linear and angular kinematics	LO1, LO2, LO5,	Chapter 11, Pages 359-369
6	Video analysis Kinematics	LO1- LO5	Chapter 2, Pages 40-53

7	Linear kinetics – Newton's Laws	LO1, LO2, LO5,	Chapter 12, Pages 379-377
8	Linear kinetics – mechanical properties of bodies in contact	LO1, LO2, LO5,	Chapter 12, Pages 374-403
9	Principle of Equilibrium	LO1, LO2, LO5,	Chapter 13, Pages 410-437
10	Angular kinetics	LO1, LO2, LO5,	Chapter 14, Pages 443-465
11	Fluid mechanics	LO1, LO2, LO5,	Chapter 15, Pages 470-493
12	Group presentation	LO1- LO5	
13	Course Review and Assignment Discussion/ Feedback	LO1- LO5	

## Appendix 1 – Marking rubric

### GROUP PRESENTATION

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
<b>Quality of presentation (max 25)</b>	Information provided clearly answers the question set out. Presentation is clear and the flow is coherent and logical. Pace is appropriate.	Information mostly answers the question set. Presentation is mostly clear and the flow generally coherent and logical.	There are weaknesses or absences in the information provided and the flow of presentation is unclear at times.	Much of the information provided does not answer the question and the flow is difficult to understand.	Little relevant information and unclear flow.
<b>Familiarity with material (max 40)</b>	Demonstrates a very good understanding of the material. Able to answer questions in a poised and articulate manner with a high level of confidence.	Demonstrates a good understanding of the material. Able to answer most of the questions clearly and with confidence.	Demonstrates a basic understanding of the material. Able to answer some of the questions clearly but lacks confidence at times.	Demonstrates a weak understanding of the material. Has difficulty in answering questions and lacks confidence.	Does not demonstrate any understanding of the material. Unable to answer questions.
<b>Use of technology (max 10)</b>	Uses relevant technology very well to supplement and enhance the quality of presentation.	Good use of technology to improve the presentation.	Some use of technology to help improve the presentation.	Little use of relevant technology in the presentation.	No clear use of technology in the presentation.
<b>Communication and teamwork (max 25)</b>	Communication is very clear and easy to understand. All members of the team make strong, worthwhile contributions.	Communication is clear and easy to understand most of the time. Most members of the team make good contributions.	Communication is unclear at times. Varied contributions of different team members.	Communication is unclear and there and difficult to understand. Most contribution provided by a single team member.	Communication is unclear and not possible to understand. No team member makes worthwhile contribution.

\*Each group member's score may vary according to observations, the group feedback, and individual's contribution to the group's final product and one another's learning.

### Assessment Criteria for Individual assignment

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
<b>Quality of report (max 50)</b>	Report is very clear and easy to understand. The flow of writing is coherent and logical. Pace is appropriate.	Report is clear and easy to understand most of the time. The flow of writing is generally coherent and logical.	Report is unclear at times. There is some weakness in the presentation flow.	Report is unclear and there is some difficulty in understanding the writing.	Report is unclear and it is not possible to understand the writing.
<b>Familiarity with study (max 50)</b>	Demonstrates a very good understanding of the background of the research, the research design, the analysis of the findings and the implications of the results of the study.	Demonstrates a good understanding of the background of the research, the research design, the analysis of the findings and the implications of the results of the study.	Demonstrates a basic understanding of the background of the research, the research design, the analysis of the findings and the implications of the results of the study.	Demonstrates a weak understanding of the background of the research, the research design, the analysis of the findings and the implications of the results of the study.	Does not demonstrate any understanding of the background of the research, the research design, the analysis of the findings and the implications of the results of the study.