



**SPORT SCIENCE & MANAGEMENT  
SS3212 ANALYTICAL BIOMECHANICS**

<b>Pre-requisites</b>	SS2102 Introduction to Sport Biomechanics
<b>No of AUs</b>	3
<b>Contact Hours</b>	Total hours: 39

**Course Aims**

This course focus on the biomechanical analysis of human motion using both theoretical and experimental techniques. The topics covered are mostly related to human locomotion on-land and in-water, besides the modelling of the sports performance. The aim of the course is to develop your ability to conduct biomechanical analysis independently and to critically evaluate research findings in Sports Science.

**Intended Learning Outcomes (ILO)**

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

1. Explain the theoretical background in human locomotion and its relationship to sports performance and injury
2. Interpret data collected;
3. Conduct a research project using biomechanical techniques;
4. Share the findings of a research project using biomechanical techniques
5. Critically evaluate the strength and weakness of research findings in the area of sport biomechanics.

**Course Content**

The following topics will be covered:

1. Research Methods in Biomechanics
2. Theoretical Approach in Biomechanics
3. Data Processing
4. Data Interpretation
5. Critique of Current Literature

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

Component	Course ILO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/ Individual	Assessment rubrics
1. Assignment	ILO #2	A1, B1, B3, C1	10%	Individual	Refer to Appendix 1
2. Laboratory Project - presentation	ILO #3-4	A1, A3, B1, B2, B3, B4, C1, C2, D1, E1	40%	Team	Refer to Appendix 2
3. Final Examination	ILO #1-#5	A1, A2, B1, B2, B3, C1	50%	Individual	
Total			100%		

Graduates of the SSM programme should show:

<b>Competence</b>	
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
<b>Creativity</b>	
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: {Sportsmanship}	demonstrate appropriate safety, concern and good conduct in sport situations towards other individuals involved in the activity

**Formative feedback**

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 human locomotion.

During the completion of the Group Presentation, as a group, you will be provided with verbal feedback pertaining to your assessed performance. Generic feedback will be provided to examination.

## Learning and Teaching approach

Approach	How does this approach support you in achieving the learning outcomes?
Lectures	Lectures will provide background information about key concepts and theories
Laboratories	Laboratories will: <ul style="list-style-type: none"><li>- Give hands-on experiential learning to support key theories and information provided in lectures</li><li>- Provide tasks for you to utilise what has been shared in lectures to solve specific problems</li><li>- Setup of group activities and discussions to allow you to assimilate the content</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.
Paper clubs	Discussion of the strength and weakness of research papers found in the literature

## Reading and References

1. Robertson, Caldwell, Hamill, Kamen and Whittlesey (2004). *Research Methods in Biomechanics*. Human Kinetics.
2. Payton and Bartlett (2008). *Biomechanical Evaluation of Movement in Sport and Exercise. The British Association of Sport and Exercise Sciences Guidelines*. Routledge.
3. Hong and Bartlett (2008). *Routledge Handbook of Biomechanics and Human Movement Science (1st ed)*. Routledge.
4. Winter (2004). *Biomechanics and Motor Control of Human Movement (3<sup>rd</sup> ed)*. John Wiley & Sons, Inc.

## 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 physical exercise. 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**

<b>Week</b>	<b>Topic</b>	<b>Course LO</b>	<b>Readings/Activities</b>
Week 1	Biomechanics in Sports: overview and introduction	ILO #1	References #1,#2,#3,#4
Weeks 2-6	Theoretical Approach in Biomechanics, Data Processing, Data Interpretation	ILO #1-2	References #1,#2,#3,#4
Week 7	Assignment	ILO #5	
Weeks 8-12	Theoretical Approach in Biomechanics, Data Processing, Data Interpretation	ILO #2	References #1,#2,#3,#4
Weeks 13	Laboratory Project - presentation	ILO #3-4	

## Appendix 1: Assessment Criteria for Assignment

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
<b>Quality of report (max 30)</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 70)</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.

## Appendix 2: Assessment Criteria for Laboratory Project - presentation

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
<b>Team Assessment (60 marks)</b>					
<b>Quality of presentation (max 20)</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 30)</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>Individual Assessment (20 marks)</b>					
<b>Communication (max 20)</b>	Presentation is well paced, very clear and easy to understand.	Presentation is well paced, clear and easy to understand most of the time.	Presentation is rushed or dull, unclear at times.	Presentation is unclear and difficult to understand.	Did not present
<b>Peer Assessment (20 marks)</b>					

<b>Teamwork (max 20)</b>	Strong and worthwhile contributions to the team	Good and consistent contributions to the team.	Fair contributions to the team.	Poor contribution to the team.	No contribution to team.
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