Unit Title:	Biomechanics
Unit Level:	Three
Unit Credit Value:	6
Unit Code:	WNI837
Unit Type:	Academic Subject Content
Unit Review Date:	31/12/2028
Graded / Ungraded:	Graded

This unit has 3 learning outcomes:

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The learner will:	**The learner can:**
1. Understand movement in relation to sports performance.	1.1 Describe the planes and axes of movement used in different sporting examples. 1.2 Describe movements on each plane using different sporting examples. 1.3 Explain how different levers are used in sport and exercise.
2. Examine forces acting on sports performers and their equipment.	2.1 Define biomechanical principles. 2.2 Explain Newton's Laws of Motion in relation to sports performance. 2.3 Explain how forces impact on sport and exercise performance.
3. Be able to analyse movement in sport.	3.1 Analyse a specific movement in sport and exercise performance.

Assessment (Graded)

1. Meets assessment criteria	At least a Pass
2. Further grading	
▪ Meets assessment criteria but not merit grading standards	Pass
▪ Meets assessment criteria and merit but not distinction grading standards	Merit
▪ Meets assessment criteria and distinction grading standards	Distinction

Indicative content

The following content is to be included in the delivery of the unit.

Learning outcomes	Indicative content
1 Planes and axes of Movement	• planes, i.e. o sagittal o transverse o frontal • axes, i.e. o transverse o longitudinal o frontal **Movements on each plane in sport** • flexion • extension • abduction • adduction • plantar flexion • dorsi flexion • lateral rotation • medial rotation • horizontal adduction • horizontal abduction
1 – Levers - definition of mechanical advantage	**First-Class Lever:** • Fulcrum between Effort and Resistance: • Example: Head-neck extension in wrestling. • Application: Movement of the head involves the neck (fulcrum), muscles at the back of the neck (effort force), and the resistance of the head itself. **Second-Class Lever:**

	• Resistance between Fulcrum and Effort: • Example: Plantarflexion in jumping. • Application: The ball of the foot acts as the fulcrum, the calf muscles provide the effort force, and the resistance is the body weight. **Third-Class Lever:** • Effort between Fulcrum and Resistance: • Example: Bicep curl in weightlifting. • Application: The elbow joint acts as the fulcrum, the bicep muscles provide the effort force, and the resistance is the weight being lifted
2- Biomechanical Principles	• momentum • inertia • mass • weight • force • stability
2 - Newton's three laws of Motion	**Newton's First Law of Motion (Law of Inertia):** • Definition of inertia and its relevance in sports. • Application of the first law to sports activities and equipment. • Examples of sports scenarios where the first law is evident (e.g., a sprinter starting a race). **Newton's Second Law of Motion (law of acceleration)** • Formula F = ma and its components. • Application of force, mass, and acceleration in sports. • Analysis of how athletes generate force in various sports movements (e.g., throwing, kicking, or hitting). **Newton's Third Law of Motion (Action and Reaction):** • Explanation of action and reaction pairs. • Application of the third law to sports interactions. • Examples in sports where the third law is evident (e.g., impact in collisions or contact sports).
2 - Forces	**Reaction forces**

	• Internal forces (e.g. muscle contraction, bone support, connective tissue) • External forces (e.g. gravity, air resistance, other participants/objects) • The application of forces in sport (e.g. where force is applied on a football determining direction of spin/curve) **Friction** • satic • rolling • sliding friction, • implications of friction forces for sports performance **Air resistance** Definition effects of air resistance on projectiles to include parabolic, nearly parabolic and asymmetric flight paths **Aerodynamics** **Factors affecting speed of flow around an object:** o speed of movement o shape of object o nature of the object's surface. • **Types of flow:** o laminar flow (air flows in parallel lines around an object) o turbulent flow (air flows in a violent, mixed-up way) o impact of turbulence on moving bodies and objects. • **Implications of turbulence for sports performance**
3 - Methods for analysing movement	• through peer/coach observation • slow motion video, • software/apps • still images • use of equipment, physical (lab and field) testing
3- Movement analysis	• specific sporting movements (e.g. tennis serve, golf swing, somersault in trampolining) • phases of movement (e.g. preparatory phase, execution phase, recovery phase) • joints involved and their sequence of movement (e.g. a shot-putter using ankle, knee, hip, shoulder, elbow, wrist and finger joints in the right order to increase the distance of their throw) • plane(s) and axes in which the movement occurs. • forces involved. • levers involved.

Indicative content

The following content is to be included in the assessment of the unit.

Learning outcomes	Indicative content
1. Understand movement in relation to sports performance	
2. Examine forces acting on sports performers and their equipment	Learners will be able to define the Biomechanical Principles in the indicative content providing relevant sporting examples. Learners will provide explanations of how reaction force, friction forces, air resistance and aerodynamics impacts on sport and exercise performers and their equipment. They will use practical examples to identify where each force is acting.
3. Be able to analyse movement in sport	The learner must use at least one chosen method to record and analyse the performer of any chosen sporting movement they must record the results and consider the following in the analysis: • movement phases (preparation, execution and follow-through) involved in the action. • joints involved and the sequence and types of joint movements. • planes and axes in which the movement is taking place Levers. • Biomechanical principles • Forces • Application of Newton's law of Motion

Assessment methodology

The following assessment methods are suggested for the assessment of this unit.

- Report
- Presentation
- Case Study
- Academic Poster
- Nutritional plan