Program	BS Physical Education	Course Code	PE-355	Credit Hours	01
Course Title	**Sports Biomechanics (Practical)**				

Course Introduction

The practical component of the Sports Biomechanics course is designed to give students hands-on experience in analyzing human movement and understanding the mechanical principles underlying sports performance. Students will engage in various activities, including motion analysis, force measurement, and biomechanical modelling. These practical sessions reinforce theoretical knowledge and develop valuable skills essential for sports science and physical education.

Learning Outcomes

On the completion of the course, the students will:

- Understand the fundamental principles of biomechanics and their application to sports.
- Analyze human movement using biomechanical principles.
- Apply biomechanical concepts to enhance athletic performance and prevent injuries.
- Utilize biomechanical tools and technologies for movement analysis.
- Critically evaluate biomechanical research and its implications for sports practice.

	Course Content	Assignments/Readings
Week 1	**Introduction to Practical Sessions** • Orientation to the biomechanics lab • Safety procedures and ethical considerations in biomechanical testing • Overview of practical session objectives and expectations	From Books and Class Lectures
Week 2	**Basic Kinematic Analysis** • Introduction to kinematics: displacement, velocity, acceleration • Using video analysis software for motion capture • Analyzing basic movements such as walking and running	From Books and Class Lectures
Week 3	**Advanced Kinematic Analysis** • Analyzing complex movements in different sports • Identifying key phases of movement and critical events • Using software to create kinematic graphs and reports	From Books and Class Lectures

Week 4	**Force Measurement** • Introduction to kinetics: forces and torques • Using force plates to measure ground reaction forces • Analyzing force data during different activities	From Books and Class Lectures
Week 5	**Joint Angle and Range of Motion Analysis** • Measuring joint angles using goniometers and inclinometers • Analyzing the range of motion in different sports movements • Comparing joint angles and range of motion across athletes	From Books and Class Lectures
Week 6	**Muscle Activity Measurement** • Introduction to electromyography (EMG) • Recording and analyzing muscle activity during different movements • Understanding muscle activation patterns in various sports	From Books and Class Lectures
Week 7	**Biomechanical Modeling** • Creating simple biomechanical models of the human body • Understanding the principles of inverse dynamics • Using software to simulate and analyze sports movements	From Books and Class Lectures
Week 8	**Gait Analysis** • Understanding the biomechanics of gait • Conducting gait analysis using motion capture and force plates • Analyzing gait parameters and identifying abnormalities	From Books and Class Lectures
Week 9	**Jump Analysis** • Analyzing the biomechanics of vertical and horizontal jumps • Using motion capture and force plates to measure jump performance • Understanding the factors influencing jump height and distance	From Books and Class Lectures
Week 10	**Throwing and Striking Analysis** • Analyzing the biomechanics of throwing and striking motions	From Books and Class Lectures

	• Recording and analyzing data using high-speed cameras and force plates • Identifying key performance indicators in throwing and striking	
Week 11	**Balance and Stability Analysis** • Understanding the biomechanics of balance and stability • Conducting balance tests using force plates and balance boards • Analyzing balance data and identifying factors affecting stability	From Books and Class Lectures
Week 12	**Biomechanics of Equipment and Technology** • Analyzing the impact of sports equipment on performance • Conducting tests to evaluate the biomechanics of different equipment • Understanding the role of technology in enhancing sports performance	From Books and Class Lectures
Week 13	**Biomechanical Assessment in Rehabilitation** • Applying biomechanics in injury prevention and rehabilitation • Conducting biomechanical assessments for injured athletes • Analyzing data to develop rehabilitation programs	From Books and Class Lectures
Week 14	**Sports Performance Analysis** • Integrating kinematic and kinetic data for performance analysis • Conducting comprehensive biomechanical assessments of athletes • Developing strategies to enhance sports performance based on biomechanical data	From Books and Class Lectures
Week 15	**Practical Exam Preparation** • Review of key concepts and techniques learned throughout the course • Hands-on practice with equipment and software • Preparation for the practical exam	From Books and Class Lectures
Week 16	**Practical Exam and Review** • Practical exam assessing skills learned throughout the course • Review session and discussion of key learnings	From Books and Class Lectures

	• Course wrap-up and feedback	

Textbooks and Reading Material

Textbooks

- Hall, S. J. (2019). Basic biomechanics (8th ed.). McGraw-Hill Education.
- Hamill, J., Knutzen, K. M., & Derrick, T. (2020). Biomechanical basis of human movement (5th ed.). Wolters Kluwer Health.
- Luttgens, K., & Hamilton, N. (2021). Kinesiology: Scientific basis of human motion (12th ed.). McGraw-Hill Education.
- McGinnis, P. (2017). Biomechanics of sport and exercise (4th ed.). Human Kinetics.
- Robertson, G. E., Caldwell, G. E., Hamill, J., Kamen, G., & Whittlesey, S. N. (2018). Research methods in biomechanics (2nd ed.). Human Kinetics.
- Watkins, J. (2018). An introduction to biomechanics of sport and exercise (2nd ed.). Routledge.