| Program | BS Physical Education | Course Code | PE-355 | Credit Hours | 02 |
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| **Course Title** | **Sports Biomechanics (Theory)** | | | | |

**Course Introduction**

This course offers a comprehensive study of biomechanics in the context of sports and physical education. It covers the principles of mechanics as they apply to human movement, focusing on analyzing and improving athletic performance and reducing injury risk. Students will learn through theoretical concepts and practical applications, including motion analysis, force measurement, and biomechanical software.

**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 |
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| Week 1 | **Introduction to Biomechanics**<br>• Definition and scope of biomechanics<br>• History and development of biomechanics in sports<br>• Overview of the course | From Books and Class Lectures |
| Week 2 | **Basic Principles of Biomechanics**<br>• Kinematics and kinetics<br>• Types of motion: linear, angular, and general<br>• Forces and their effects on movement | From Books and Class Lectures |
| Week 3 | **Anatomy and Functional Biomechanics**<br>• Musculoskeletal system and its components<br>• Functional anatomy related to movement<br>• Muscle mechanics and joint function | From Books and Class Lectures |
| Week 4 | **Linear Kinematics**<br>• Displacement, velocity, and acceleration<br>• Projectile motion in sports<br>• Case studies and examples | From Books and Class Lectures |
| Week 5 | **Angular Kinematics**<br>• Angular displacement, velocity, and acceleration<br>• Rotational motion in sports<br>• Case studies and examples | From Books and Class Lectures |
| Week 6 | **Linear Kinetics**<br>• Newton's laws of motion<br>• Application of forces: gravity, friction, and air resistance | From Books and Class Lectures |

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| | • Impulse and momentum | |
| Week 7 | **Angular Kinetics**<br>• Torque and moment of inertia<br>• Angular momentum and its conservation<br>• Application to sports movements | From Books and Class Lectures |
| Week 8 | **Practical Session: Motion Analysis Techniques**<br>• Introduction to motion capture systems<br>• Analyzing sports movements using video analysis<br>• Practical applications | From Books and Class Lectures |
| Week 9 | **Biomechanics of the Lower Extremity**<br>• Hip, knee, and ankle biomechanics<br>• Common injuries and prevention strategies<br>• Case studies and applications | From Books and Class Lectures |
| Week 10 | **Biomechanics of the Upper Extremity**<br>• Shoulder, elbow, and wrist biomechanics<br>• Common injuries and prevention strategies<br>• Case studies and applications | From Books and Class Lectures |
| Week 11 | **Biomechanics of the Spine**<br>• Structure and function of the spine<br>• Spinal loading and injury mechanisms<br>• Case studies and applications | From Books and Class Lectures |
| Week 12 | **Equipment and Technology in Biomechanics**<br>• Force plates, electromyography (EMG), and pressure sensors<br>• Use of software for biomechanical analysis<br>• Emerging technologies in biomechanics | From Books and Class Lectures |
| Week 13 | **Enhancing Athletic Performance**<br>• Biomechanical analysis of technique and skill<br>• Optimizing performance through biomechanical principles<br>• Case studies and practical examples | From Books and Class Lectures |
| Week 14 | **Injury Prevention and Rehabilitation**<br>• Mechanisms of sports injuries<br>• Biomechanical strategies for injury prevention<br>• Rehabilitation techniques and their biomechanical basis | From Books and Class Lectures |
| Week 15 | **Practical Session: Biomechanical Research and Data Analysis**<br>• Designing and conducting biomechanical research<br>• Data collection and analysis<br>• Presenting biomechanical research findings | From Books and Class Lectures |

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| Week 16 | **Review and Final Exam Preparation**<br><br>• Review of key concepts and principles<br>• Mock exams and practice questions<br>• Final exam preparation | From Books and Class Lectures |

**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.

**Suggested Readings**

- **Journals**: Journal of Biomechanics, Sports Biomechanics, Clinical Biomechanics
- **Websites**: International Society of Biomechanics, American Society of Biomechanics
- **Videos**: Online tutorials and lectures on biomechanics and movement analysis