

BIOMECHANICS

(2+1 Cr. Hr)

COURSE OBJECTIVES

This course has been designed to impart basic scientific technical information about body movements involved in sports activities by elaborating biomechanics, form of motion, Kinematics of Physical Activities, Analyzing Games techniques.

COURSE CONTENTS:

i. INTRODUCTION

- a. Definition and Prospective
- b. Why study Biomechanics
- c. Importance of Biomechanics for Coach and Athlete
- d. Qualitative & Quantitative Biomechanical Analysis

ii. HUMAN MOMENTS

- a. Form of Motion
- b. Linear
- c. Angular
- d. General Motion
- e. Types of Movements
- f. Factor effecting Human Movement

iii. KINETIC CONCEPTS FOR ANALYZING HUMAN MOTION

- a. Linear Kinetics;
Inertia, Mass, Force, Newton's Laws of Motion. Friction, Impulse, Conservation of Momentum, impact, Pressure, work
- b. Angular Kinetics;
Eccentric Force, Moment, Resultant Moment, Equilibrium, levers-Center of Gravity, Moment of Inertia, Angular, Momentum, Centripetal and Centrifugal force.

iv. KINEMATIC CONCEPTS FOR ANALYZING HUMAN MOTION

- a. Linear Kinematics:
Vectors and Scalars, Distance and Displacement, Speed and Velocity, Acceleration, Projectile Motion
- b. Angular Kinematics:
Angular Distance and Displacement, Angular Speed, Velocity and Acceleration

v. **HUMAN MOVEMENT IN FLUID MEDIUM**

- a. Nature of Fluids:
 - i. Laminar versus Turbulent flow
- b. Fluid properties
 - i. Buoyancy:
 - a). Characteristic of Buoyancy forces
 - b). Flotation
 - c). Flotation of the Human Body
- c. Drag
 - i. Skin friction, Form Drag, Wave Drag
- d. Lift Forces:
 - i. Foil shape
 - ii. Magnus Effects

vi. **BIOMECHANICAL ANALYSIS OF SPORTS TECHNIQUES (Practical)**

- a. Cricket
- b. Football
- c. Basketball
- d. Handball
- e. Gymnastics
- f. Hockey
- g. Badminton
- h. Table Tennis
- i. Track & Field (Running, Throwing & Jumping)
- j. Swimming
- k. Volleyball

RECOMMENDED BOOKS

1. Oomens, C., Brekelmans, M., Loerakker, S., & Baaijens, F. (2018). *Biomechanics: concepts and computation*. Cambridge University Press.
2. Özkaya, N., Leger, D., Goldsheyder, D., & Nordin, M. (2016). *Fundamentals of biomechanics: equilibrium, motion, and deformation*. Springer.
3. Macchiarelli, R., & Zanolli, C. (2017). Hominin biomechanics, virtual anatomy and inner structural morphology: From head to toe. A tribute to Laurent Puymeraul.
4. Blazeovich, A., & Blazeovich, A. J. (2017). *Sports biomechanics: the basics: optimising human performance*. Bloomsbury Publishing.
5. Hume, P. A., Kerr, D. A., & Ackland, T. R. (Eds.). (2018). *Best Practice Protocols for Physique Assessment in Sport*. Springer Singapore.