



DEPARTMENT OF PHYSICAL EDUCATION

MASTER OF PHYSICAL EDUCATION

Semester IV Theory Course

MDH552: SPORTS BIOMECHANICS AND KINESIOLOGY

Number of credits: 4	Number of hours : 4	Marks : Internal - 30 External - 70
Objectives:		
At the end of the course the student should understand		
• The meaning and scope of Kinesiology and Biomechanics in Physical Education and sports • The location of muscles and the involvement of muscles in movement • Principles of physics as applied to sports skills • Application of laws of biomechanics in various skills and athletic events. • The methods of analyzing skills and detecting faults during the performance of these skills. • Usage of various techniques and tools to analyse skills. • The method of improvising skills thereby increasing efficiency of skill performance		

Unit I - Introduction to Biomechanics and meaning of terms

- Meaning and scope of Biomechanics, Meaning of terms- Kinetics and Kinematics, Speed, Velocity, Acceleration, Momentum, Force, Mass, parallelogram of forces, Gravity, work, energy
- Meaning and scope of Kinesiology, Planes and Axis, Fundamental movements at joints – Cervical (neck), shoulder, elbow, Wrist, vertebral (trunk), Hip, Knee and ankle. Neural basis of movement – motor units, proprioception.

Unit II – Skeletal System and Muscular system

- Skeletal system, types of joints, Joint stability, Range of motion; Muscular system – shapes of muscles, factors affecting force of muscle contraction, Role of muscles – Agonists or prime movers, antagonists, Synergists or neutralizers, fixators or stabilizers.
- **Different muscles of the body** – Their locations, attachments and actions.
Muscles of the upper body: Latissimus Dorsi, Rotator cuff (Infraspinatus, Supraspinatus, Subscapularis, Teres minor), Pectoralis major and minor, Rhomboid major and minor, Teres major, Trapezius, Triceps Brachii, Biceps Brachii, Brachialis, Deltoids, Scalene, Sternocleidomastoid, Rectus Abdominus
Muscles of the lower body: muscles of the neck, shoulders, upper back, lower back, abdomen, lower abdomen, Gluteus group (Gluteus major, medius and

minor), quadriceps group (Rectus Femoris, VastusLateralis, VastusMedialis, Vastusintermedius), hamstring group (Biceps femoris, Semi tendinosus, Semi membranousus), tibialis anterior, Gastrocnemius and soleus, Sartorius, Tensor Fascia Lata - their locations and actions.

Unit III – Motion and Force

- Motion, types of motion, Newton's laws related to linear and angular motion, Projectile motion – Trajectory, Factors affecting horizontal range; Velocity, acceleration, momentum as applied to linear and angular motion.
- Force, types of force, Friction, Centripetal and centrifugal force.
- Air and water resistance – their applications in sports
- Gravity, center of gravity, Kinetic and Potential energy.

Unit IV – Levers, Stability and Analysis of skills

- Levers – Types and classes of levers, Stability – factors affecting stability
- **Kinesiological and Biomechanical analysis** – qualitative and quantitative analysis, tools of analysis. Analysis of track and field events (sprint, long jump, high jump, shot put, discus throw), selected skills in games (shooting in basketball, push, scoop and hit in hockey, kick, heading and stopping in football, service and spiking in volleyball, bowling and batting in cricket, Kabaddi, khokho, tennis service and drive)

REFERENCE:

- Deshpande S. H. (2002). Manav Kriya Vigyan – Kinesiology (Hindi Edition) Amravati: Hanuman Vyayam Prasarak Mandal.
- Hoffman S.J. Introduction to Kinesiology (Human Kinesiology publication In.2005. Steven Roy, & Richard Irvin. (1983). Sports Medicine. New Jersey: Prentice hall.
- Thomas. (2001). Manual of structural Kinesiology, New York: McGraw Hill.
- Uppal A.K. Lawrence Mamta MP Kinesiology (Friends Publication India 2004)
- Uppal, A (2004), Kinesiology in Physical Education and Exercise Science, Delhi Friends publications.
- Williams M (1982) Biomechanics of Human Motion, Philadelphia; Saunders Co.
- Lynn S. Lippert (2006), Clinical Kinesiology and Anatomy (4th Ed), E A Davis Company, Philadelphia
- Peggy A Houglum and Dolores B. Bertoti (2011), Brunnstrom's clinical Kinesiology (6th Ed.), E A Davis Company, Philadelphia
- Carol A Oatis (2009), Kinesiology – Mechanics and Pathomechanics of Human Movement (2nd Ed.), Lippincott Williams and Wilkins, Philadelphia