

**Semester III  
Theory Courses**

**MPEC-301 SPORTS ENGINEERING (Elective)**

**Unit - I Introduction to sports engineering and Technology**

Meaning of sports engineering, human motion detection and recording, human performance, assessment, equipment and facility designing and sports related instrumentation and measurement.

**Unit - II Mechanics of engineering materials**

Concept of internal force, axial force, shear force, bending moment, torsion, energy method to find displacement of structure, strain energy. Biomechanics of daily and common activities –Gait, Posture, Body levers, ergonomics, Mechanical principles in movements such as lifting, walking, running, throwing, jumping, pulling, pushing etc.

**Unit- III Sports Dynamics**

Introduction to Dynamics, Kinematics to particles – rectilinear and plane curvilinear motion coordinate system. Kinetics of particles – Newton's laws of Motion, Work, Energy, Impulse and momentum.

**Unit- IV Building and Maintenance:**

Sports Infrastructure- Gymnasium, Pavilion, Swimming Pool, Indoor Stadium, Out-door Stadium, Play Park, Academic Block, Administrative Block, Research Block, Library, Sports Hostels, etc.

Requirements: Air ventilation, Day light, Lighting arrangement, Galleries, Store rooms, Office, Toilet Blocks (M/F), Drinking Water, Sewage and Waste Water disposal system, Changing Rooms ( M/F), Sound System (echo-free), Internal arrangement according to need and nature of activity to be performed, Corridors and Gates for free movement of people, Emergency provisions of lighting, fire and exits, Eco-friendly outer surrounding. Maintenance staff, financial consideration.

**Building process:-** design phase (including brief documentation), construction phase functional (occupational) life, Re-evaluation, refurbish, demolish.

**Maintenance policy,** preventive maintenance, corrective maintenance, record and register for maintenance.

**Unit – V Facility life cycle costing**

Basics of theoretical analysis of cost, total life cost concepts, maintenance costs, energy cost, capital cost and taxation

## **Reference**

- Franz K. F. et. al., Editor, **Routledge Handbook of Sports Technology and Engineering** (Routledge, 2013)
- Steve Hake, Editor, **The Engineering of Sport** (CRC Press, 1996)
- Franz K. F. et. al., Editor **The Impact of Technology on Sports II** (CRC Press, 2007)
- Helge N., **Sports Aerodynamics** (Springer Science & Business Media, 2009)
- Youlin Hong, Editor **Routledge Handbook of Ergonomics in Sport and Exercise** (Routledge, 2013)
- Jenkins M., Editor **Materials in Sports Equipment, Volume I** (Elsevier, 2003)
- Colin White, **Projectile Dynamics in Sport: Principles and Applications**
- Eric C. et al., Editor **Sports Facility Operations Management** (Routledge, 2010)