

SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Biomedical Science)
Semester: IV
Syllabus with Effect from: June - 2014

Paper Code: PT04EBMC01	Total Credit: 4
Title of Paper: Biodynamics	

Unit	Description in Detail	Weightage (%)
I	Introduction to fluid mechanics: Fluid properties, basic laws governing conservation of mass momentum and energy; Laminar flow, Couette flow and Hagen-Poiseuille equation, turbulent flow. Bernoulli's equation and its clinical significance, Make up of blood vessels, Angiology, Compliance and Elastance, Wind Kessel Model, Flow dynamical study of circulatory system, heart and blood vessels, anatomy and physiological considerations; Components and functions of arterial and venous systems; Lymphatic system;	25%
II	Fluid dynamics of hard and soft tissues: Hard tissues: Bone structure and composition mechanical properties of bone, cortical and cancellous bones, viscoelastic properties, Maxwell and Voight models – anisotropy, Electrical properties of bone, fracture mechanism and crack propagation in bones, fracture fixators, repairing of bones, mechanical properties of collagen rich tissues, teeth and its properties. Soft tissues: Structure and functions of cartilages, tendons, ligaments, stress-strain relationship, soft tissue mechanics, mechanical testing of soft tissues standard sample preparation, cross-section measurement, clamping of the specimen, strain measurement, environmental control), time dependent properties of testing.	25%
III	Biomechanics of joints: Skeletal joints, skeletal muscles, basic considerations, basic assumption and limitations, forces and stresses in human joints, mechanics of the elbow, mechanics of shoulder, mechanics of spinal column, mechanics of hip, mechanics of knee, mechanics of ankle. Locomotion: Human locomotion, gait analysis and goniometry, Ergonomics, Foot Pressure measurements – Pedobarograph, Force platform, mechanics of foot. Total Hip Prosthesis: requirements, different types of components, Stress analysis and instrumentation, Knee Prosthesis.	25%
IV	Body fluids and their motions: Flow of Newtonian and non-Newtonian fluids in rigid tubes, flexible tubes and collapsible tubes; Blood flow through arteries and veins; Holt and Conrads experimental investigations. Kinetic energy, flow, pressure-flow relations in vascular beds; Cardiac cycle; Cardiac valve dysfunctions; Blood pressure, regulation and controlling factors; Coronary circulation, heart failure. Left ventricle pressure- volume (P-V) relationship and P-V relationship in different valve diseases	25%

Basic Text & Reference Books:-

- Fung, Y.C. Biomechanics: Circulation, Springer Verlag Publications New York.
- Waite L., Biofluid mechanics in cardiovascular system, Mc Grawhill Publications
- Hall S. J., Basic Biomechanics 3rd Edition, WCB/McGraw Hill Publications

