

GANPAT UNIVERSITY										
FACULTY OF ENGINEERING & TECHNOLOGY										
Programme		Bachelor of Technology			Branch/Spec.		Biomedical Engineering			
Semester		VII			Version		2.0.0.0			
Effective from Academic Year				2017-18		Effective for the batch Admitted in			July 2017	
Subject code		2BM702		Subject Name		Biomechanics & Design Ergonomics				
Teaching scheme					Examination scheme (Marks)					
(Per week)	Lecture(DT)		Practical(Lab.)		Total			CE	SEE	Total
	L	TU	P	TW						
Credit	3	-	1	-	4	Theory		40	60	100
Hours	3	-	2	-	5	Practical		25	25	50
Pre-requisites: Good Knowledge of Mechanics, Muscular system, Skeleton system & body joints.										
<b>Learning Outcome:</b> The educational objectives of the course are to educate students to attain the following:										
<ul style="list-style-type: none"> <li>• Understand fundamentals of Biomechanics</li> <li>• To understand analyse biomechanics of several body joint under loading condition</li> <li>• To understand the effect of forces and its outcome and its impact on human locomotion</li> <li>• To analyse the biomechanics of fundamental joint movements</li> <li>• To understand the basics of design ergonomics</li> </ul>										
<b>Theory syllabus</b>										
Unit	Content									Hrs.
1	<b>INTRODUCTION TO MECHANICS AND LOADS ON HUMAN BODY</b> Introduction to forces and force vectors, reference position and cardinal planes, Forms of motion and movements with respect to cardinal planes, Internal forces and external forces acting on human body, Effect of forces, Static and Dynamic Equilibrium									4
2	<b>BIOMECHANICS OF JOINTS &amp; MUSCLES: ITS FUNDAMENTAL</b> Introduction to Biomechanics, Fundamental research domains and application areas of biomechanics, Types of joints, Properties of skeletal muscles, Tension in muscular fibers, velocity & length – tension relationship, Mechanical characteristics of muscles: Power, endurance, fatigue Torque									6
3	<b>BIOMECHANICS OF UPPER &amp; LOWER EXTREMITIES</b> Shoulder: Structure and movements of Shoulder joint, Loading conditions on Shoulder joint Elbow: Structure and movements of Elbow joint, Loading conditions on Elbow joint Hip: Structure and movements of Hip joint, Loading conditions on Hip Joint Knee: Structure and movements of Knee joint, Loading conditions on Knee Joint Co-relation between Biomechanics of (i) Shoulder & Hip (ii) Knee & Elbow									8
4	<b>HUMAN MOVEMENT &amp; EQUILIBRIUM</b> Classification of mechanical levers and its fundamentals, Classification of anatomical levers and its examples, Equations describing static and dynamic equilibrium of human body, Centre of Gravity & its measurement techniques, Center of Mass and its importance in biomechanics									7
5	<b>KINETICS &amp; KINEMATICS OF HUMAN POSTURES</b> Basics of Kinematics & kinetics of human postures, Biomechanical analysis two legged and one legged static stance, biomechanical analysis of sitting and lying									7
6	<b>KINETICS &amp; KINEMATICS OF HUMAN LOCOMOTION</b> Gait cycle & its phases, Ground reactance forces during gait cycle, Gate measurement & analysis its methods									6
7	<b>OCCUPATIONAL ERGONOMICS</b> Introduction to ergonomics, General ergonomics, Biomechanical factors affecting ergonomics, Understanding biomechanics of occupation involving heavy stress on upper or lower limb, Improvements in design of tools over period of time: A case study approach for assisting device.									6
Practical content: <b>Term Work and Practical shall be based on the above syllabus.</b>										
<b>Text Books:</b>										
1	Basic Biomechanics Susan J. Hall, Pub. Mc Graw-Hill									
2	GAIT Analysis- Normal and Pathological Function Jacquelin Perry, Pub. Slack Inc.N.J									
<b>Reference Books</b>										
1	Biomechanics of Human Motion - by T. McClurg Anderson, Sports Pub., 2007.									
2	Biomechanics in Ergonomics: Edited By Shravan Kumar, Taylor & Francis									