

Course Number: ME 622

Course Name: Biomechanics of Musculoskeletal System

Credit: 3-0-0-0

Prerequisites: ME206-Mechanics of solids, IC240- Mechanics of Rigid Bodies, IC242-Continuum Mechanics, ME352-Finite Element Methods in Engineering

Students intended for: UG/PG

Elective or Core: Elective

Semester: Odd/Even

Preamble:

The main objective of the course is to introduce students to provide basic understanding of mechanics and its application to biological systems.

Course Outline:

The course introduces the basic concept and structure of human musculoskeletal system, Biomechanical behaviour of bone and joints, bone modelling and biomaterials.

Course Modules:

1. Introduction to Biomechanics, Basic terminology and concept of human musculoskeletal system, anatomy and overall function. **(L4)**
2. Biomechanics of Tissues and Structures of musculoskeletal system – composition and structure. **(L3)**
3. Biomechanical behaviour- bone, articular cartilage, muscle, tendon and ligament. **(L8)**
4. Biomechanics of joints – structure, range of motions, musculoskeletal model of forces: (i) hip; (ii) knee; (iii) shoulder; (iv) elbow; (v) spine, lubrication of joints. **(L8)**
5. Motion and gait analysis – method, gait cycle, segmental kinetics, engineering approaches to posture analysis. **(L6)**
6. Joint replacement and fracture fixation – stress analysis and basic design approach, failure mechanisms, wear in joint arthroplasty, bone remodelling. **(L8)**
7. Biomaterials – properties and application. **(L2)**
8. Image Processing Techniques: Quantitative CT-scan / MRI reconstruction and generation of solid (CAD) models. **(L3)**

Text Books:

1. Basic Biomechanics of the Musculoskeletal System (3rd edition), by M. Nordin and V.H. Frankel, Publisher: LWW, ISBN: 0-683-30247-7
2. Biomechanics by Y. C. Fung, Springer (2nd Edition), ISBN 978-81-8128-811-0
3. An Introduction to Biomechanics, by J.D. Humphery and S.L. Delange, Publisher: Springer, ISBN 978-81-8128-719-9

Reference Books:

1. Biomechanics and Biomaterials in Orthopedics, by Dominique G. Poitout, Publisher: Springer,

ISBN: 1-85233-481-9

2. Orthopaedic Biomaterials in Research and Practice by Kelvin L. Ong, Scott Lovald, Jonathan Black, CRC Press (2nd Edition), ISBN 978-1-4665-0350-2