

**Course Number: 28881**

**Course Name: Orthopedic Biomechanics**

Course Type: Theory
Prerequisite: Nothing
Level: Graduate
Group: Applied mechanics

Type & Max Unit: Constant 3
Corequisite: Nothing.
First Presentation: 2013-2
Last Edition: 2016-2.

### Objectives:

The main goal of this course is to present the applications of biomechanics principles and methodologies in orthopedics. The biomechanics of bone and its fractures are studied and the mechanics of fracture fixation and healing process, in relation to the mechanoregulation theories, are presented. Also, the biomechanics of human joint are studied and the biomechanical design considerations of joint replacement systems are presented.

### Topics:

- **Introduction:** Orthopaedic Disorders and Interventions, Orthopaedic Biomechanics and its Applications
- **Biomechanics of Bone:** Functions of Skeletal System, Bone Composition and Structure, Bone Mechanical Properties, Mechanobiology of Bone
- **Bone Fracture and Healing:** Fracture Mechanisms, Fracture Treatment, Fracture Healing Process, Healing Mechanics, Theories of Mechanoregulation
- **Fracture Fixation Devices:** Bone Implant Materials, External Fixations Systems, Internal Fixation Systems
- **Biomechanics of Joints:** Structure and Function of Synovial Joints, Biomechanics of Knee Joint, Biomechanics of Patellofemoral Joint, Experimental Methods in Joint Biomechanics, Modeling of Joints
- **Biomechanics of Joint Replacement:** Design Considerations of Joint Replacement Systems, Joint Implant Materials, Implant Fixation Methods, Design of Mechanical Constraints, Design of Articulating Surfaces

### References:

- 1- Donald L. Bartel, Dwight T. Davy and Tony M. Keaveny, *Orthopedic Biomechanics: Mechanics and Design in Musculoskeletal Systems*, Pearson Prentice Hall Bioengineering, 2006.
- 2- Van C. Mow and Rik Huiskes, *Basic Orthopaedic Biomechanics and Meachanobiology*, 3rd edition, Lippincott Williams & Wilkins, 2005.
- 3- Benno M. Nigg and Walter Herzog, *Biomechanics of the Musculo-skeletal System*, 3rd Edition, John Wiley & Sons Inc, 2007.
- 4- A.A. Biewener, *Biomechanics Structures and Systems- A Practical Approach*, Oxford University Press, 1992.
- 5- David L. Hamblen and A.Hamish Simpson, *Adams's Outline of Orthopaedics*, 13th edition, Churchill Livingstone, 2001.