

Orthopaedic Biomechanics BE 125

Syllabus – Fall 2021

1. Basic Information

Course: Orthopaedic Biomechanics for Bioengineers
Place and Time: TBD (M/W 12-2 Requested)
Faculty: Sophia Sangiorgio, Ph.D.
 Professor, Orthopaedic Surgery & Bioengineering, UCLA
 Director, Biomechanics Lab at Orthopaedic Institute for Children
Office: J. Vernon Luck, Sr., M.D. Orthopaedic Research Center, 5th Floor
 Orthopaedic Institute for Children
 403 W. Adams Blvd.
 Los Angeles, CA 90007
Email: ssangiorgio@mednet.ucla.edu
Office Hours: TBD, Following lecture, or by appointment
Teaching Assistant: Jenna Wahbeh, Email: jennamarie@g.ucla.edu
Discussion: 1 hour, TBD

2. Course Plan

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|----------------|-----------|-----------|--|
| Week 1 | 1 | M Sept 27 | Orthopedic Biomechanical Terminology & Basic Anatomy |
| | 2 | W Sept 29 | Introduction to Mechanical Engineering and Free Body Diagrams |
| Week 2 | 3 | M Oct 4 | Free Body Diagrams- Upper Extremity Joint Reaction Forces |
| | 4 | W Oct 6 | Free Body Diagrams-Lower Extremity Joint Reaction Forces |
| Week 3 | 5 | M Oct 11 | Quiz #1/ FBD Review & Internal measurements of Joint Reaction forces |
| | 6 | W Oct 13 | Material v. Structural Properties & Introduction to Stress Analysis |
| Week 4 | 7 | M Oct 18 | Fracture Patterns in Long Bones and Modes of Failure (Stress Analysis) Cont. |
| | 8 | W Oct 20 | Fracture Fixation – Overview of Fracture fixation –(Guest lecture-IM Nails) |
| Week 5 | 9 | M Oct 25 | Fracture Fixation- Fracture healing, Indications for use and types of plates |
| | 10 | W Oct 27 | Fracture Fixation- Stress Analysis continued & IM Fixation |
| Week 6 | 11 | M Nov 1 | MIDTERM |
| | 12 | W Nov 3 | History of Total Hip Replacements – Charnley, Low Friction Arthroplasty |
| Week 7 | 13 | M Nov 8 | Wolff’s Law – Cemented Stem Design vs. Non-Cemented Stem Design |
| | 14 | W Nov 10 | Contemporary THR Designs and Bearing Materials |
| Week 8 | 15 | M Nov 15 | Tribology and Joint Replacement Bearings Continued |
| | 16 | W Nov 17 | Overview of Total Knee Replacement Designs |
| Week 9 | 17 | M Nov 22 | Quiz #2/ Joint Registries |
| | 18 | W Nov 24 | Thanksgiving (No Lecture) |
| Week 10 | 19 | M Nov 29 | Introduction to Spine Biomechanics |
| | 20 | W Dec 1 | Overview of Spine Fixation Implants, Hysteresis and Pure Moment Testing |

3. Textbook

None

4. Grading Rubric

Undergraduate Students:

| Assessment | Proportion |
|------------|------------|
| Homework | 25% |
| Quizzes | 25% |
| Midterm | 25% |
| Final | 25% |

Graduate Students:

| Assessment | Proportion |
|------------|------------|
| Homework | 20% |
| Quizzes | 20% |
| Midterm | 20% |
| Final | 20% |
| Term Paper | 10% |

Homework: A total of eight homework assignments will be assigned over the course of the quarter. Students are free to work together and seek help from the professor or TA, but each student is responsible for submitting his or her own work for a grade.