

## **BME 698-002 Injury Biomechanics-Traumatic Brain Injury**

Call #14670

3 credits (graduate level), 3 contact hours

**Class times:** Tuesdays -1:00 to 3:55 AM; CHEN conference room

**Office Hours:** By appointments on Tuesdays 10 AM to 12 PM at CHEN 105.

**Instructor:** Namas Chandra, Ph. D, P.E.

**Course coordinator:** Namas Chandra, Ph. D, PE

### **Course Objectives:**

This is an advanced level course where the students will read materials provided by the instructor and available literature to link injury biomechanics to tissue biochemistry and neurobehavior. This study will include humans as well as experimental animal models. We will focus on both blunt and blast brain injury in humans and animal models.

### **Textbooks(s)/Materials Required:**

Course notes by instructor,

Published Papers in the area of brain injury

### **Description:**

The number one killer of young adults (ages 15-24) is road accidents in USA as well as rest of the world. Accidents from motor vehicles, falls, blasts and sports all cause short- and long-term injuries. Injuries lead to significant loss of quality of life to the victims, their families and society. TBI including sports concussions is a predominant health hazard. How can we understand the etiology and medical outcome.

At the completion of this course the student should be able to:

- Understand the injury biomechanics as a field relating injury causing events to injury related acute and chronic medical outcomes.
- Define different classification of brain injuries in relation to loads and mechanisms of injuries.
- Understand the difference between injuries to soft and hard biological matter Understand the physiology of head, brain and neck and their injury criteria
- Offer diagnostic, prognostic and rehabilitative methods to brain injuries including concussion

**Grading policy:**

Students are expected to abide strictly to the NJIT code of honor which can be viewed at <http://www.njit.edu/academics/honorcode.php>.

**Course Grading:**

Calls presentations (3 per student)	25%
Projects (2)	50%
Final project	25%

**In class participation:**

In class discussion is an important component of the learning process. Since this is an advanced class, in-class discussion on the topic will also be evaluated. Enhance the collective learning process by volunteering responses when called upon to do so.

## **Course content:**

1. Introduction
  - 1.1. Statistics of morbidity and mortality in accidents
  - 1.2. Classification
    - 1.2.1. Based on events: Motor vehicle accidents; falls; blasts; sports; work-related; violence; defense
    - 1.2.2. Based on mechanics: Blunt, Blast, Ballistics
  - 1.3. Basic concepts of biomechanics
  - 1.4. Injury criteria, injury scales, injury risk curves
2. Injury Bio-Mechanics Concepts
  - 2.1. Equations of motion
  - 2.2. Momentum principles
  - 2.3. Collision mechanics
3. Brain Physiology and Functional maps
  - 3.1. Statistics of morbidity and mortality in accidents
  - 3.2. Classification
    - 3.2.1. Based on events: Motor vehicle accidents; falls; blasts; sports; work-related; violence; defense
    - 3.2.2. Based on mechanics: Blunt, Blast, Ballistics
  - 3.3. Basic concepts of biomechanics
  - 3.4. Injury criteria
4. Head and brain injuries (3 weeks)
  - 4.1. Injury and injury mechanisms
  - 4.2. Head Injury Criterion
  - 4.3. Head injury in sports
  - 4.4. Traumatic Brain Injuries: mild, moderate, severe and concussions.
  - 4.5. Preventions
  - 4.6. Head injury among pedestrians
5. Experimental methods in Injury Assessment
  - 5.1. Blunt impacts
  - 5.2. Blast impacts
  - 5.3. Measurement methods

## **Pre-requisites:**

Co-registration with BME451 and 452; or special permission by the instructor.

Approximate schedule of classes

Date	classes	contents	Homework	projects
20-Jan	1	ch 1-introduction	1 posted	1 posted
27-Jan	2	ch 2-mechanics		
3-Feb	3	ch 2-mechanics	1 due	2 posted
10-Feb	4	ch3-Neuroanatomy	2 posted	1 due
17-Feb	5	ch3-Neurologists		experiments posted
24-Feb	6	ch4-blast		
3-Mar	7	ch4-blunt	2 due	
10-Mar	8	ch4-ballistics		2 due
17-Mar	spring break	march 15-22		major posted
24-Mar	9	ch5-experiments	3 posted	
31-Mar	10	ch5-measurements		
7-Apr	11	april 3 good Friday	3 due	
14-Apr	12	ch5-ATD		
21-Apr	13	ch5-animal		experiments due
28-Apr	14	Review		major due
5-May	Friday sch			
8-14 may	Final exam	exact date n/a		