Hand and Brain

Introduction and Course requirements

This course concerns the relationship of hand and brain from many different perspectives including structure, function, evolution and neural control.

Two introductory chapters by Hollerbach and three primary books constitute the main reading. The books include: *Haptics*, Lynette A. Jones, MIT Press, 2018; *Human Hand Function*, Lynette A. Jones and Susan J. Lederman, Oxford University Press, 2006; and *The Hand*, Frank R. Wilson. Vintage, 1999 (paperback edition). Princeton Science Library. Additional reading includes 20 research articles. Laboratory demonstrations of hand function and motor adaptation will also be part of the course.

Each class will begin with a 90 minute lecture. After a 20 minute break, the class will resume with presentations and discussions of two of the reading papers. Two students will present and lead discussion of one of the papers and two other students will present the other paper. The entire class will participate in asking questions and discussing the papers. Over the semester each student will have participated in presenting two papers. There will be a brief 10 minute quiz at the end of each class.

The goal of the course is to give you a broad comprehensive knowledge of human hand function from biomechanics, and neuromuscular control to cognitive representation. The format is a combination of lecture and seminar.

Grading will be based on participation in class discussions, presentations of papers in class, the regular quizzes, and the final exam.

**SYLLABUS**

Jan 15  
Introduction

Jan 29  
*Haptics* – Lynette A. Jones  
Chapter 1: How We Perceive the World via Touch  
Chapter 2: Sensory and Motor Specialization of the Hand  
Chapter 3: Haptic Perception  
Chapter 4: Haptic Illusions  
Chapter 5: Tactile and Haptic Displays

Feb 5  
*Haptics* – Lynette A. Jones  
Chapter 6: Tactile Communication Systems  
Chapter 7: Surface Haptics  
Chapter 8: Artificial Sensing: Prosthetic and Robotic Hands  
Chapter 9: Conclusions

Feb 12  
Chapter 4: Puppet lesions from Alexandria and Dusseldorf  
Chapter 5: Hand, eye and sky  
Chapter 6: The grip of the past

Feb 26  
Chapter 7: The twenty-four-karat thumb  
Chapter 8: The right hand knows what the left hand just did  
Chapter 9: Bad boys, polyliths, and the heterotechnic revolution
Mar 5  
Chapter 10: The articulate hand  
Chapter 11: In tune and evolving prestissimo  
Chapter 12: Lucy to Lulu to Rose

Mar 12  
Midterm

Mar 19  
Chapter 13: Tough, tender, and tenacious  
Chapter 14: Hidden in the hand  
Chapter 15: Head for the hands

Mar 26  
Lab Demos

Apr 2  
*Human Hand Function*, Lynette A, Jones and Susan Lederman  
Chapter 1: Historical Overview and General Introduction  
Chapter 2: Evolutionary Development and Anatomy of the Hand

Apr 9  
*Human Hand Function*, Lynette A, Jones and Susan Lederman  
Chapter 3: Neurophysiology of Hand Function  
Chapter 4: Tactile Sensing

Apr 16  
*Human Hand Function*, Lynette A, Jones and Susan Lederman  
Chapter 5: Active Haptic Sensing  
Chapter 6: Prehension

Apr 30  
*Human Hand Function*, Lynette A, Jones and Susan Lederman  
Chapter 7: Non-prehensile Skilled Movements  
Chapter 8: End-effector Constraints