

BSEN 412/812 – Rehabilitation Engineering
COURSE SYLLABUS

General Information:

Course Time: Tuesday/Thursday 3:30-4:45pm

Course Location: Chase Hall Room 112

Instructor

Dr. Becky Wachs

Office: Morrison 268

Phone: (402) 472-2262

Email: rebecca.wachs@unl.edu

Office Hours: By appointment

Course Hours and Credit

This course is a 3-credit hour semester course.

About This Course

This course is an introductory course in rehabilitation engineering. The course will expose students to common human disabilities and engineering methods and tools that can be used assist people with disabilities to function effectively in society.

Catalog Description

Application of engineering methods to the development of assistive technology for people with injuries and disabilities. Characterization of the physical and mental capabilities of people with impairment, universal design, assistive technologies associated with seating, transportation, communication, and recreation. A major focus of this class will be on engineering design and it will include large design project.

Prerequisites

None

Learning Goals

After completion of Rehabilitation Engineering, students should be able to:

- Detail the history and evolution of the field of rehabilitation engineering.
- Apply universal design concepts in engineering design for broad populations.
- Detail how nerves and muscles work (signals and function) and how they are utilized in assistive devices and rehabilitation technology.
- Compare and contrast the major causes of motor deficits, current clinical rehabilitation approaches, current research approaches, and current clinical challenges.
- Compare and contrast the major causes of sensory deficits, current clinical rehabilitation approaches, current research approaches, and current clinical challenges.
- Critically analyze a rehabilitation engineering problem, identify patient needs, and propose a design solution.
- Communicate effectively with a wide range of audiences.

Required Textbook

The required textbook for this course is An Introduction to Rehabilitation Engineering (ISBN-13: 978-0849372223, ISBN-10: 0849372224). This book is available at the UNL bookstore as well as on Amazon for purchase or rent. Additional supplemental reading will be supplied via Canvas.

POLICIES

Attendance

Attendance is mandatory and contributes to your participation score for the course.

Masking

Given current CDC guidance and the current transmission level of COVID-19 in our community, masking is required in class.

Homework

Homework will be assigned regularly throughout the semester. Assignments will always be due in Canvas by the start of class Tuesday (3:30pm). Late HW will not be accepted.

Exams

Two exams will be given throughout the course. Laptop computers or notes may not be used in the exam.

Topical Research Presentation

Student groups (2 or 3 students) will be assigned a topic associated with rehabilitation technology. Groups will be expected to research this technology and prepare a presentation for the class on this topic covering current technologies and approaches, and challenges. The goal of this presentation is to explain the current state of the art and identify a need for future work. Presentations will be given in early-March.

Design Project – Presentation and Proposal

The same student groups assigned for the topical research presentation will propose a design solution to one need identified in their topical research presentation. Groups will be expected to develop a proposed solution and design for a device (or other type of technological product) and prepare a presentation and a written proposal on this topic. Presentations will be given in the second half of the semester and be formatted as a Ted Talk. Additional details will be provided on this project later in the semester.

Special Policies

Graduate students taking this course as BSEN 812 will be required to complete the topical research presentation and design project as an individual.

Recording of Class Related Activity

I invite all of you to join me in actively creating and contributing to a positive, productive, and respectful classroom culture. Each student contributes to an environment that shapes the learning process. Any work and/or communication that you are privy to as a member of this course should be treated as the intellectual property of the speaker/creator and is not to be shared outside the context of this course.

Students may not make or distribute screen captures, audio/video recordings of, or livestream, any class-related activity, including lectures and presentations, without express prior written consent from me or an approved accommodation from Services for Students with Disabilities. If you have (or think you may have) a disability such that you need to record or tape class-related activities, you should contact Services for Students with Disabilities. If you have an accommodation to record class-related activities, those recordings

may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Failure to follow this policy on recording or distributing class-related activities may subject you to discipline under the Student Code of Conduct.

Furthermore, please note that any lecture may be recorded throughout the duration of this course.

Academic Integrity and Dishonesty

Students are expected to adhere to guidelines concerning academic dishonesty outlined in the University's Student Code of Conduct (<https://studentconduct.unl.edu/student-code-conduct>) as outlined in Section B. Conduct – rules and regulations, 1. Acts of Academic Dishonesty. Students are encouraged to contact Dr. Wachs for clarification of these guidelines if they have questions or concerns.

ADA

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 232 Canfield Administration, 472-3787 voice or TTY.

Final Grades

The following percentages will be used in calculating your final grade:

- Homework (10 HW Assignments) – 20%
- Exams (2 Exams) – 30%
- Presentations (2 Presentations) – 20%
- Final Proposal (1 Final Proposal) – 20%
- Participation and Attendance – 10%

The grading scale for this course will be based on the following scale:

- A: 94% or above
- A-: 90%-93%
- B+: 87%-89%
- B: 84%-86%
- B-: 80%-83%
- C+: 76%-79%
- C: 74%-76%
- C-: 70%-73%
- D: 60%-69%

There will be a gray area between each grade in the final distribution, so that two people getting the same weighted average grade could get different letter grades. If you are in these gray areas, whether you get the higher or lower grade will depend upon: whether your test and homework performance has been improving or declining. Please note that although Canvas will provide you with a total score for the points allocated in the course, this score has not been weighted by the scale given above and may not reflect your grade in the course.

Emergency Response Measures

- **Fire Alarm (or other evacuation):** In the event of a fire alarm: Gather belongings (Purse, keys, cellphone, N-Card, etc.) and use the nearest exit to leave the building. Do not use the elevators. After exiting notify emergency personnel of the location of persons unable to exit the building. Do not return to building unless told to do so by emergency personnel.
- **Tornado Warning:** When sirens sound, move to the lowest interior area of building or designated shelter. Stay away from windows and stay near an inside wall when possible.
- **Active Shooter**
 - **Evacuate:** if there is a safe escape path, leave belongings behind, keep hands visible and follow police officer instructions.
 - **Hide out:** If evacuation is impossible secure yourself in your space by turning out lights, closing blinds and barricading doors if possible.
 - **Take action:** As a last resort, and only when your life is in imminent danger, attempt to disrupt and/or incapacitate the active shooter.
- **UNL Alert:** Notifications about serious incidents on campus are sent via text message, email, unl.edu website, and social media. For more information go to: <http://unlalert.unl.edu>.
- Additional Emergency Procedures can be found here: http://emergency.unl.edu/doc/Emergency_Procedures_Quicklist.pdf

Course Schedule – Spring 2020

01/18 – Module 1 - Introduction to Rehabilitation Engineering

01/20 – Module 2 - Nervous System Components

01/25 - Module 3 – Muscle Function and EMG

01/27 - Module 4 – Paralysis

02/01 – Module 5 – Amputations

02/03 - Module 6 – Guest Lecture – Dr. Koto Takahashi – University of Nebraska - Omaha

02/08 – Module 7 – Recorded Guest Lecture – Dr. Curt Tomasevicz– University of Nebraska - Lincoln

02/10 – Module 8 – Stroke and Hemiplegia and Other Motor System Impairments and Injuries

02/15 – Module 9 – Guest Lecture – Dr. Carolin Curtze – University of Nebraska - Omaha

02/17 – Module 10 – Guest Lecture – Dr. Kevin Pitt – University of Nebraska - Lincoln

02/22 – Module 11 – Age-related Changes to the Musculoskeletal System

02/24 – Module 12 – Science Communication Basics

03/01 – Module 13 – The importance of communicating our science - Guest Lecture – Dr. Heather Akin – University of Nebraska-Lincoln

03/03 – **EXAM 1**

03/08 – Student Topical Research Presentations

03/10 – Student Topical Research Presentations

03/15 – *Spring Break*

03/17 – *Spring Break*

03/22 – Module 14 – Universal Design – Guest Lecture – Dr. Meaghan Walls Hearing – Assistology, LLC

03/24 – Module 15 – Hearing

03/29 – Module 16 – Guest Lecture - Dr. Marc Brennan – University of Nebraska Lincoln

03/31 – Module 17 – How to Give an Amazing Presentation and Write a Winning Proposal

04/05 – Module 18 – Guest Lecture – Dr. Mackenzie Savaiano – University of Nebraska – Lincoln

04/07 – Module 19 – Human Vision

04/12 – Module 20 – Attention Resources/ Attention Deficit Disorders, Memory and Alzheimer's

04/14 – In Class Project Work Time

04/19 – **EXAM 2**

04/21 – In Class Project Work Time

04/26 – **No Class** - Individual Team Meetings with Dr. Wachs to Review Ted Talk

04/28 – **No Class** – Individual Team Meetings with Dr. Wachs to Review Ted Talk

05/03 - Student Ted Talks

05/05 – Student Ted Talks

05/06 – Final Design Proposal Due by 5:00pm

Course schedule subject to change.