BIOMECHANICS AND KINESIOLOGY, PHD

School of Health and Kinesiology, Department of Biomechanics, College of Education, Health, and Human Sciences

Vision Statement
The doctoral degree in biomechanics and kinesiology at the University of Nebraska at Omaha (UNO) is a joint program between the Department of Biomechanics and the School of Health and Kinesiology. The degree is based on the physiology, biochemistry, biophysics, motor control and development, and psychology of human movement. The program is aimed at developing researchers who are working to improve movement function and physical activity using evidence-based approaches through interdisciplinary clinical and translational research. A problem-solving approach is used across the age and health spectrum for disease prevention, health enhancement, physical rehabilitation, and motivation for physical activity. The program offers four areas of concentration in biomechanics, physiology of exercise, motor development and control, and physical activity.

Program Contact Information
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ryanklatt@unomaha.edu (eeitzmann@unomaha.edu)


Admissions
General Application Requirements and Admission Criteria (http://catalog.unomaha.edu/graduate/admission/)

Program-Specific Requirements
Application Deadlines (Spring 2022, Summer 2022, and Fall 2022)
Applications for this program are accepted on a rolling basis. All materials must be submitted prior to the beginning of the semester in which the student has elected to begin coursework. To receive full consideration for departmental assistantships, applications must be received by January 31st.

Other Requirements
- GPA of 3.2 in master’s program or in the last 30 hours of previous graduate work
- Master’s degree, or minimum of 30 graduate hours in a related field, e.g., health, physical therapy

Degree Requirements

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**Concentrations**

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Biomechanics and Kinesiology, PhD

KINS 8206  PLANNING WORKSITE WELLNESS PROGRAMS
KINS 8240  SPORT IN AMERICAN CULTURE
KINS 8280  CURRICULUM IN PHYSICAL EDUCATION
KINS 8506  BEHAVIORAL ASPECTS OF COACHING
KINS 8800  RISK MANAGEMENT FOR HEALTH FITNESS PROFESSIONALS
KINS 8856  CARDIOVASCULAR DISEASE PREVENTION AND REHABILITATION
KINS 8700  PSYCHOLOGY OF PHYSICAL ACTIVITY
KINS 8910  RESEARCH PROJECT
KINS 8966  TOPICS IN SPORTS MEDICINE
BMKI 9820  SERVICE EXPERIENCE IN HIGHER EDUCATION
BMKI 9401  MOTOR LEARNING I
BMKI 9421  MOTOR DEVELOPMENT
BMKI 9500  MOTOR LEARNING II
HEKI 8000  SPECIAL STUDIES
HEKI 8220  PROBLEMS & ISSUES IN HPER
HEKI 8100  RESEARCH PROJECT
HEKI 8300  ANALYSIS OF RESEARCH AND LITERATURE IN HUMAN MOVEMENT
HEKI 8500  QUALITATIVE RESEARCH METHODS
BIOC 827  Metabolic Regulatory Mechanisms
Total Credits 24

Biomechanics Concentration

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Electives 9

Select 9 hours from the following:

BMCH 8106  BIOINSPIRED ROBOTICS
BMCH 8206  METHODS IN BIOMECHANICS I
BMCH 8216  METHODS IN BIOMECHANICS II
BMCH 8646  ORTHOPEDIC BIOMECHANICS
BMKI 9421  MOTOR DEVELOPMENT
BMKI 9520  MOTOR DEVELOPMENT II
BMKI 9411  MOTOR CONTROL I
BMKI 9510  MOTOR CONTROL II
BMKI 9101  NONLINEAR ANALYSIS FOR MOVEMENT STUDIES
BMKI 9911  INDEPENDENT STUDY IN BIOMECHANICS
BMKI 9201  MATLAB FOR MOVEMENT SCIENCES
BMKI 9870  MUSCULOSKELETAL SIMULATION
BSEN 814  Medical Imaging Systems
BSEN 912  Advanced Diagnostic Ultrasound Imaging
CEEN 8336  Microprocessor System Design
CEEN 8366  Embedded Microcontroller Design
CIP 814  Scientific Writing
CIP 817  Applied Scientific Writing
CSCI 8325  DATA STRUCTURES
CSCI 8400  ADVANCED COMPUTER GRAPHICS
CSCI 8456  INTRODUCTION TO ARTIFICIAL INTELLIGENCE
CSCI 8476  PATTERN RECOGNITION
CSCI/MATH 8500  NUMERICAL LINEAR ALGEBRA
CSCI/MATH 8510  NUMERICAL DIFFERENTIAL EQUATIONS
CSCI 8626  COMPUTER GRAPHICS
CSCI 8256  HUMAN COMPUTER INTERACTION
ELEC 8606  Labview Programming
ELEC 8636  Digital Signal Processing
ELEC 9150  Adaptive Signal Processing
ENGL 8610  PROFESSIONAL AND TECHNICAL WRITING
GCBA 812  Human Neuranatomy
GERO/PHHB 8556  HEALTH ASPECTS OF AGING
GERO 9460  SEMINAR IN AGING AND HUMAN BEHAVIOR
HEKI 8300  ANALYSIS OF RESEARCH AND LITERATURE IN HUMAN MOVEMENT
HEKI 8500  QUALITATIVE RESEARCH METHODS
ITIN 8006  SPECIAL TOPICS IN IT INNOVATION
BMKI 9851  EXERCISE FOR SPECIAL POPULATIONS
MATH 8250  PARTIAL DIFFERENTIAL EQUATIONS
MATH 8336  INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS
MATH 8356  ORDINARY DIFFERENTIAL EQUATIONS
MATH 8080  DESIGN AND ANALYSIS OF ALGORITHMS
MATH/CSCI 8306  DETERMINISTIC OPERATIONS RESEARCH MODELS
MATH/CSCI 8316  PROBABILISTIC OPERATIONS RESEARCH MODELS
MATH 8400  DYNAMICAL SYSTEMS AND CHAOS
MATH/CSCI 8766  TOPICS IN APPLIED MATHEMATICS
MATH 9110  ADVANCED TOPICS IN APPLIED MATHEMATICS
MENG 8386  MECHANICS OF BIOMATERIALS
NEUR 8006  SYSTEMS NEUROSCIENCE
KINS 8086  CLINICAL EXERCISE PHYSIOLOGY
BMKI 9131  IMPLEMENTING PHYSICAL ACTIVITY IN DIVERSE POPULATIONS
BMKI 9141  PHYSICAL ACTIVITY ASSESSMENT AND HEALTH RELATED RESEARCH
KINS 8856  CARDIOVASCULAR DISEASE PREVENTION AND REHABILITATION
BMKI 9951  ADVANCED EXERCISE PHYSIOLOGY
BMKI 9960  ADVANCED EXERCISE PHYSIOLOGY II
PHYS 8505  ELEMENTS OF ELECTRONICS
PSYC 9010  PROSEMINAR: STATISTICAL METHODS I
PSYC 9020  PROSEMINAR: STATISTICAL METHODS II
PSYC 9070  PROSEMINAR: COGNITIVE PSYCHOLOGY

Total Credits 24
## Motor Development and Control Concentration

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<tr>
<td>BMKI 9101</td>
<td>NONLINEAR ANALYSIS FOR MOVEMENT STUDIES</td>
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### Required Courses

- **BMKI 9421**: MOTOR DEVELOPMENT
- **BMKI 9460**: ADVANCED BIOMECHANICS II
- **BMKI 9500**: MOTOR LEARNING II
- **BMKI 9510**: MOTOR CONTROL II
- **BMKI 9101**: NONLINEAR ANALYSIS FOR MOVEMENT STUDIES

### Electives

Select 9 hours from the following:

- **BMCH 8206**: METHODS IN BIOMECHANICS I
- **BMCH 8216**: METHODS IN BIOMECHANICS II
- **BMKI 9401**: MOTOR LEARNING I
- **BMKI 9411**: MOTOR CONTROL I
- **BMKI 9520**: MOTOR DEVELOPMENT II
- **BMKI 9201**: MATLAB FOR MOVEMENT SCIENCES
- **BMKI 9451**: ADVANCED BIOMECHANICS
- **BMKI 9911**: INDEPENDENT STUDY IN BIOMECHANICS
- **BMKI 9870**: MUSCULOSKELETAL SIMULATION
- **CSCI 8626**: COMPUTER GRAPHICS
- **CSCI 8256**: HUMAN COMPUTER INTERACTION
- **ELEC 8606**: Labview Programming
- **ELEC 8636**: Digital Signal Processing
- **ELEC 9150**: Adoptive Signal Processing
- **ENGL 8610**: PROFESSIONAL AND TECHNICAL WRITING
- **GERO/PHHB 8556**: HEALTH ASPECTS OF AGING
- **GERO 9460**: SEMINAR IN AGING AND HUMAN BEHAVIOR
- **NEUR 8006**: SYSTEMS NEUROSCIENCE
- **KINS 8086**: CLINICAL EXERCISE PHYSIOLOGY
- **KINS 8130/9131**: IMPLEMENTING PHYSICAL ACTIVITY IN DIVERSE POPULATIONS
- **BMKI 9141**: PHYSICAL ACTIVITY ASSESSMENT AND HEALTH RELATED RESEARCH
- **KINS 8856**: CARDIOVASCULAR DISEASE PREVENTION AND REHABILITATION
- **BMKI 9951**: ADVANCED EXERCISE PHYSIOLOGY
- **BMKI 9810**: HIGHER EDUCATION TEACHING SEMINAR
- **BMKI 9820**: SERVICE EXPERIENCE IN HIGHER EDUCATION
- **BMKI 9401**: MOTOR LEARNING I
- **BMKI 9411**: MOTOR CONTROL I
- **BMKI 9421**: MOTOR DEVELOPMENT
- **BMKI 9451**: ADVANCED BIOMECHANICS
- **BMKI 9460**: ADVANCED BIOMECHANICS II
- **BMKI 9500**: MOTOR LEARNING II
- **BMKI 9510**: MOTOR CONTROL II
- **BMKI 9520**: MOTOR DEVELOPMENT II
- **KINS 8120**: PLANNING WORKSITE WELLNESS PROGRAMS
- **KINS 8800**: RISK MANAGEMENT FOR HEALTH FITNESS PROFESSIONALS
- **KINS 8910**: INTERNSHIP IN EXERCISE SCIENCE
- **KINS 8966**: TOPICS IN SPORTS MEDICINE
- **HEKI 8000**: SPECIAL STUDIES
- **HEKI 8100**: RESEARCH PROJECT
- **HEKI 8206**: CURRENT TOPICS IN WEIGHT MANAGEMENT
- **HEKI 8220**: PROGRAM EVALUATION AND INSTRUMENTATION
- **HEKI 8300**: ANALYSIS OF RESEARCH AND LITERATURE IN HUMAN MOVEMENT
- **HEKI 8500**: QUALITATIVE RESEARCH METHODS
- **PHHB 8450**: EPIDEMIOLOGY & PREVENTION OF DISEASE
- **PHHB/SOC 8706**: WOMEN'S HEALTH AND ISSUES OF DIVERSITY

### Total Credits

24

## Physical Activity Concentration

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### Required Courses

- **BMKI 9131**: IMPLEMENTING PHYSICAL ACTIVITY IN DIVERSE POPULATIONS
- **BMKI 9141**: PHYSICAL ACTIVITY ASSESSMENT AND HEALTH RELATED RESEARCH
- **BMKI 9701**: PSYCHOLOGY OF PHYSICAL ACTIVITY
- **BMKI 9851**: EXERCISE FOR SPECIAL POPULATIONS
- **BMKI 9050**: PHYSICAL ACTIVITY EPIDEMIOLOGY

### Electives

Select 9 hours from the following:

- **KINS 8120**: CURRENT TOPICS IN WEIGHT MANAGEMENT
- **KINS 8856**: CARDIOVASCULAR DISEASE PREVENTION AND REHABILITATION
- **BMKI 9951**: ADVANCED EXERCISE PHYSIOLOGY
- **BMKI 9810**: HIGHER EDUCATION TEACHING SEMINAR
- **BMKI 9820**: SERVICE EXPERIENCE IN HIGHER EDUCATION
- **BMKI 9401**: MOTOR LEARNING I
- **BMKI 9411**: MOTOR CONTROL I
- **BMKI 9421**: MOTOR DEVELOPMENT
- **BMKI 9451**: ADVANCED BIOMECHANICS
- **BMKI 9460**: ADVANCED BIOMECHANICS II
- **BMKI 9500**: MOTOR LEARNING II
- **BMKI 9510**: MOTOR CONTROL II
- **BMKI 9520**: MOTOR DEVELOPMENT II
- **KINS 8120**: PLANNING WORKSITE WELLNESS PROGRAMS
- **KINS 8800**: RISK MANAGEMENT FOR HEALTH FITNESS PROFESSIONALS
- **KINS 8910**: INTERNSHIP IN EXERCISE SCIENCE
- **KINS 8966**: TOPICS IN SPORTS MEDICINE
- **HEKI 8000**: SPECIAL STUDIES
- **HEKI 8100**: RESEARCH PROJECT
- **HEKI 8206**: CURRENT TOPICS IN WEIGHT MANAGEMENT
- **HEKI 8300**: PROGRAM EVALUATION AND INSTRUMENTATION
- **HEKI 8500**: ANALYSIS OF RESEARCH AND LITERATURE IN HUMAN MOVEMENT
- **HEKI 8500**: QUALITATIVE RESEARCH METHODS
- **PHHB 8450**: EPIDEMIOLOGY & PREVENTION OF DISEASE
- **PHHB/SOC 8706**: WOMEN'S HEALTH AND ISSUES OF DIVERSITY
 BMCH 8000 SEMINAR IN BIOMECHANICS (0 credits)
Required non-credit course for graduate students in biomechanics. Intended to familiarize the graduate student with current ongoing biomechanical research at UNO and other institutions. The seminar will additionally include topics focusing on professional development, job and educational opportunities, and biomechanical methodologies.
Prerequisite(s)/Corequisite(s): Must be a student in BMCH graduate program. Not open to non-degree graduate students.

 BMCH 8006 BIOMATERIALS (3 credits)
Students will learn the classification, properties, characterization methods, and design principles of biomaterials. (Cross-listed with BMCH 4000).

 BMCH 8030 BIOSTATISTICS IN BIOMECHANICS I (3 credits)
The focus of the course is to prepare students to understand and apply research and biostatistical methods needed in the design and analysis of biomechanical investigations. The major topics to be covered include research design and multiple linear regression. (Cross-listed with BMKI 9031).
Prerequisite(s)/Corequisite(s): Graduate Standing in Biomechanics program or Department Permission.

 BMCH 8100 NONLINEAR ANALYSIS FOR MOVEMENT STUDIES (3 credits)
This course is to introduce different nonlinear methods for the analysis of biological and movement time series. Emphasis will be given on understanding the algorithms behind each nonlinear method. (Cross-listed with BMKI 9010).
Prerequisite(s)/Corequisite(s): Instructor Permission.

 BMCH 8106 BIOINSPIRED ROBOTICS (3 credits)
The goal of the course is to involve students in an interdisciplinary vision of biomechanics, biology, engineering and architecture by learning how humans and other animals function in their environment. These design principles from nature can be translated into novel devices, structures, and robots. (Cross-listed with BMCH 4100).

 BMCH 8200 MATLAB FOR MOVEMENT SCIENCES (3 credits)
Introduction to Matlab software, plotting data, spectral analysis and the Fourier transform, data smoothing, and image analysis of movement related data. All topics will be implemented using Matlab. (Cross-listed with BMKI 9201).
Prerequisite(s)/Corequisite(s): Instructor permission.

 BMCH 8206 METHODS IN BIOMECHANICS I (3 credits)
In this course students learn about the methods and equipment used in biomechanics as well as the analysis of data collected from those methods. Course experiences include both lecture and lab based learning. (Cross-listed with BMCH 4200).
Prerequisite(s)/Corequisite(s): Department Permission.

 BMCH 8216 METHODS IN BIOMECHANICS II (3 credits)
In this course students learn about advanced methods and equipment used in biomechanics, as well as the analysis of data collected from those methods. Course experiences include both lecture and lab based learning. This course builds on the experience gained in BMCH 4200/8206, Methods in Biomechanics I. (Cross-listed with BMCH 4210).
Prerequisite(s)/Corequisite(s): BMCH 8206 or Department Permission.

 BMCH 8400 MOTOR LEARNING I (3 credits)
Discussion and analysis of scientific principles related to the learning of motor skills; related literature and research in motor learning. The focus of the course is on recent theories of how movements are acquired and performed, and on factors that have implications for motor learning throughout the life span. (Cross-listed with BMKI 9401).
Prerequisite(s)/Corequisite(s): Department Permission.

 BMCH 8410 MOTOR CONTROL I (3 credits)
The focus of the course is to explore the study of the conditions and factors that influence the control and performance of motor skills from both neurophysiological and psychological perspectives. (Cross-listed with BMKI 9411).
Prerequisite(s)/Corequisite(s): Department Permission. Not open to non-degree graduate students.

 BMCH 8420 MOTOR DEVELOPMENT (3 credits)
This course focuses on the study of motor development, the processes that underlie this development and the factors that influence it. Students will gain an understanding of the major theoretical perspectives of motor development across the life span with special emphasis given in child development. (Cross-listed with BMKI 9421).
Prerequisite(s)/Corequisite(s): Department Permission.

 BMCH 8450 ADVANCED BIOMECHANICS (3 credits)
The course will address the biomechanical basis of human performance including mechanical analysis of human gait, fundamental movement patterns and techniques used for collecting biomechanical data. (Cross-listed with BMKI 9451).
Prerequisite(s)/Corequisite(s): BMCH 4630 (Biomechanics) [previously PE 4630] or Instructor Permission.

 BMCH 8464 ORTHOPEDIC BIOMECHANICS (3 credits)
Orthopedic Biomechanics focuses on the use of biomechanical principles and scientific methods to address clinical questions that are of particular interest to professionals such as orthopedic surgeons, physical therapists, rehabilitation specialists, and others. (Cross-listed with BMCH 4640).
Prerequisite(s)/Corequisite(s): Department Permission.

 BMCH 8666 CLINICAL IMMERSION FOR RESEARCH AND DESIGN (3 credits)
This course will involve exposure to current clinical practices, identification of unmet clinical needs, and information regarding future career options. In this course, students will be matched with local clinical sites to provide a unique opportunity for innovative and interdisciplinary approaches to problem solving subject to practical constraints. Concepts in clinical rehabilitation, integrated assessments, regulation of medical devices in health care will be covered. This course will review the latest research efforts for rehabilitation in the context of device design and implementation. (Cross-listed with BMCH 4660).
Prerequisite(s)/Corequisite(s): Instructor Permission. Not open to non-degree graduate students.

 BMCH 8676 INTRODUCTION TO MECHANICS OF BIOMATERIALS (3 credits)
In this course students will learn how to analyze the stresses and strains in different structures under complex loading conditions with extensive examples from biomaterials and materials generally used in the medical device field. (Cross-listed with BMCH 4670).
Prerequisite(s)/Corequisite(s): BMCH 3000 or Department Permission.
**BMCH 8686 SPORTS BIOMECHANICS (3 credits)**
This course is intended to provide students with a foundational knowledge on how to analyze sport movements through biomechanical analytical methods. Students will utilize foundational biomechanical principles and apply them to a variety of sports and associated movements. (Cross-listed with BMCH 4680).

**Prerequisite(s)/Corequisite(s):** BMCH 4630

**BMCH 8900 INDEPENDENT RESEARCH IN BIOMECHANICS (1-6 credits)**
In this course individuals or groups will conduct research projects for the study and analysis of biomechanical topics.

**Prerequisite(s)/Corequisite(s):** Permission of the Department and approval by Faculty Advisor. Not open to non-degree graduate students.

**BMCH 8910 INDEPENDENT STUDY IN BIOMECHANICS (1-6 credits)**
This is a variable credit course designed for graduate students in Biomechanics who would benefit from independent reading assignments and problems. Independent study enables individual students or a small group of students to focus on topics typically not explored in other offerings or to explore topics currently offered in further depth. (Cross-listed with BMKI 9911).

**Prerequisite(s)/Corequisite(s):** Graduate student in BMCH and approval by Faculty Advisor. Not open to non-degree graduate students.

**BMCH 8990 THESIS IN BIOMECHANICS (1-6 credits)**
A research project, designed and executed under the supervision of the chair and approval by members of the graduate student's advisory committee. In this project the student will develop skills in research design, research conduct, data analysis, and reporting. The final product of this course will be an original thesis of independent scientific investigation.

**Prerequisite(s)/Corequisite(s):** Department Permission. Not open to non-degree graduate students.