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**BIOMS Program Policy Statement**  
**Interdisciplinary Biomechanics and Movement Science Master's and Doctoral Programs**

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## **Part I. Program History**

### **A. Purpose**

The human body is comprised of a variety of complex, integrated systems. An understanding of the role of these systems with respect to even a limited set of problems, such as the performance of everyday or highly skilled motor activities or the causes and resolution of bone/joint dysfunction, requires experimental approaches from a number of disciplines. As a result, a group of faculty at the University has assembled with a mission to study the body from an interdisciplinary approach. An understanding of structural integrity along with movement generation is the basis for this program of study. The faculty come from backgrounds in physiology, biomechanics, computer science, engineering, motor control and rehabilitation science. Interests range from robotic interfaces for environmental controls for the disabled, to fracture fixation, to understanding of normal and pathological movement.

A significant percentage of the population has some form of physical disability that limits their functional abilities. The form of these disabilities may be progressive deterioration of tissue, congenital defects or trauma-inflicted damage. The adverse effects of many disabilities could be reduced or alleviated through appropriate research on topics ranging from microscopic bone remodeling to corrective device development.

The program title stems from the fact that although biomechanical methods are important to gain an understanding of human movement, such methods also play an important role in non-movement problems such as bone remodeling after injury or developing better prosthetic devices. Thus, the program attempts to bring together scientists from a number of complementary disciplines to address unresolved problems of human function that are related both directly and indirectly to problems of movement. The interdisciplinary nature of the program encourages collaborative efforts incorporating biomechanics, human physiology, motor neurophysiology, engineering and computational approaches, with the goal of improving human life. Such efforts will, in time, advance and amplify the ability of medical practitioners to respond to maladies and to prescribe appropriate preventative or corrective measures. We believe that this program provides an opportunity for graduate students to study the human body in a way not possible through any of the traditional programs currently offered at this university.

This program was formed by a group of twenty faculty and administrators from four different units. The impetus for a single unified program of study grew out of the realization that each of the four units was seeking a vehicle to create an academic program that dealt with the application of science and engineering toward solving the problems realized by the physically challenged. During the initial phase of planning, the group examined and analyzed models of existing programs in biomedical and rehabilitation engineering from institutions around the country. In addition, advice was sought from administrators of Operations Research, the University's only intercollegiate, interdisciplinary graduate program. Directors of other graduate degree programs on campus were contacted for input on how the creation of this program would impact existing graduate degree programs. The resulting program represents the synthesis of countless communications between group members, and an astounding quantity of consensus decisions reached through in-depth discussions of course requirements, seminar formats, student recruitment and admission policies, administrative structures and responsibilities, and numerous additional details.

### **B. Date of Permanent Status**

The Interdisciplinary Program in Biomechanics and Movement Science was awarded permanent status in 2000.

### **C. Degrees Offered**

The degrees awarded to those who complete this program will be either a Master's of Science in Biomechanics and Movement Science, Master of Arts in Biomechanics and Movement Science, or a Doctor of Philosophy in Biomechanics and Movement Science.

### **D. Commitment to Diversity, Equity, and Inclusion**

The College of Health Sciences (CHS) and the BIOMS Program embraces diversity, inclusion, connectedness, and professionalism as core institutional values. We believe that a diverse student, faculty, and staff body are critical to our teaching and scholarship and are a much needed reflection of the diverse patients and caregivers for whom we provide care. Beyond the University's code of conduct for students and employees, which we fully support, we have [additional standards and expectations](#) for members of CHS and BIOMS due to our important roles and influence in health and healthcare.

## **Part II. Admission**

### **A. Admission Requirements for the MS and PhD**

Applicants must submit all materials directly to the University Graduate College using the online admission process before admission can be considered. To be admitted, a student must have identified a faculty mentor and obtained their commitment for advisement.

The BIOMS admission process is completed as follows: First, finished applications consisting of the online application, undergraduate/graduate transcripts, letters of recommendation, and the written statement of goals and objectives are reviewed by BIOMS faculty members seeking new students. While submission of GRE scores is not required, applicants have the option to submit their GRE scores for faculty member review. Faculty members identify students whose background, goals, and objectives are compatible with their own areas of research and funding. The faculty member then notifies the Program Coordinator that they have agreed to advise the potential student by submitting an Application Review Checklist for the applicant. Submission of the checklist indicates proper vetting of the candidate by the advisor and that formal review of the applicant's application materials is requested by the Biomechanics and Movement Science Executive Committee. The Executive Committee arrives at an admission decision after reviewing the completed checklist and application.

All international applicants for graduate study at the University of Delaware are expected to have or gain English proficiency prior to enrolling in graduate coursework. The recommended minimum TOEFL score is 100 and/or IELTS of 7. A waiver of the TOEFL exam is only allowed when a bachelor's, master's, or doctoral degree has been or will be earned from a college or university accredited by a regional accrediting association in the United States OR from a university recognized by the ministry of education in a country where English is the primary language.

### **B. Prior Degree Requirements**

Baccalaureate degree from an accredited college or university

### **C. Application Deadlines**

BIOMS accepts applications throughout the year on a rolling basis. Students can enroll in the Fall or Spring semester, or Summer Session.

### **D. Special Competencies Needed**

Admission decisions are made by the Executive Committee of the Biomechanics and Movement Science Program. Deficiencies in more than two areas of the below requirements will automatically result in an admission denial by the Executive Committee. Students will be admitted to the program based upon enrollment availability and their ability to meet the following minimum recommended entrance requirements.

- Acceptance by a primary advisor
- A undergraduate GPA of 3.0 or higher
- Pre-requisites with a grade of “B” or better in:
  - Calculus
  - Anatomy/Physiology
  - Mix of Laboratory Science courses and/or courses most applicable to the individual’s planned area of research (12 credits)
- Submission of GRE scores is optional

Faculty advisor must indicate these laboratory science courses for consideration on the applicant’s Admission Checklist to be determined by the BIOMS Executive Committee.

### **E. Admission Categories**

Students admitted into the Biomechanics and Movement Science Program may be admitted into one of two categories.

**1) Regular:** Regular status is offered to students who meet all of the established entrance requirements, who have a record of high scholarship in their fields of specialization, and who have the ability, interest, and maturity necessary for successful study at the graduate level in a degree program.

**2) Conditional:** Conditional status is offered to applicants who are seeking admission to a degree program but lack specific prerequisites needed in the University of Delaware degree requirements. All conditional requirements, determined by the Executive Committee and communicated in writing to the student by the faculty advisor, must be met within the deadline given before regular status can be granted. Failure to meet the conditions by this deadline is grounds for dismissal from the program.

### **F. University Statement**

Admission to the graduate program is competitive. Those who meet stated requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer other appropriate strengths.

## **Part III. Academic Degree: Master of Science (MS)**

### **A. Degree Requirements for the Master of Science (MS)**

#### **1) Program of Study**

All accepted students are expected to submit a planned program of study by the end of their first semester, created with their primary advisors to be approved by the BIOMS Executive Committee. Students must complete 24 credits of standard grading courses with a grade of “B” or better, plus 6 credits of thesis to earn degree. Failure to earn a “B” grade or better in degree related coursework may be remedied by modification of the plan of study if possible. If a student is ultimately unable to successfully modify their plan of study, the student may petition the BIOMS Executive Committee for admission to the MA program in Biomechanics and Movement science. Acceptance by the Executive Committee and a Change of Classification Form must be submitted and approved by the Graduate College.

Required Courses (MS): 30 credits

- Statistics: 3 cr.
- Instrumentation: 3 cr.
- Research Methods Design/Analysis: 3 cr.
- **BMSC 622: Readings in Movement Science - Critically Evaluating the Literature:** 3 cr.
- Electives: 12 cr.
- **BMSC 865: Seminar:** 2 semesters, 0 cr.
- **BMSC 869: Master’s Thesis:** 6 cr.

## 2) Independent Study and Transfer Credits

Students in the Master’s degree program are allowed to take a maximum of 6 credits of independent study. Additional independent study credits can be taken, but will not count towards graduation. A maximum of 9 graduate credits earned at another U.S institution may be applied to the Master’s degree if not used to complete a previous degree. Grades must be a “B” or better to be acceptable for transfer and no older than five years.

## 3) Changes to the Program of Study

Students may need to alter approved programs of study once matriculated into the program due to reasons that can include scheduling conflicts or the creation of new courses directly related to the student’s goals. Students who wish to make changes to their program of study must obtain permission from their advisor and approval from the Executive Committee. Students may petition in writing for a variance in the degree requirements and must have approval from their faculty advisor and the BIOMS Executive Committee.

### **B. Committees for Theses**

#### 1) Establishment of Thesis Committee

The student and his/her advisor will create a thesis committee at the time the student begins to develop the thesis proposal. The thesis committee shall include three University faculty from within the Biomechanics and Movement Science Program, and may have no more than six members. The thesis advisor must be a member of the BIOMS faculty and at least one of the BIOMS committee members must be from an area of focus in biomechanics and movement science different from that of the advisor. With the approval of the BIOMS Executive committee, a professional staff member who holds a secondary faculty appointment within an academic department may serve as a committee member. Faculty who have retired or resigned from the University may maintain committee membership or continue to chair committees of students whose work began under their direction prior to their retirement or departure from the University. Non-tenure BIOMS faculty may co-advise BIOMS students and Co-chair the thesis committee provided that the other co-

advisor/co-chair is a tenure track BIOMS faculty member. It is the responsibility of the thesis advisor to replace members who withdraw from the committee during the thesis process.

## **2) Defense of the Thesis Proposal**

The thesis proposal must be in the format of an NIH R03 proposal. Sections A-E of the Research Plan must be included. The number of pages required will be at the discretion of the advisor. The thesis proposal defense will be scheduled only after a majority of members of the thesis committee have determined that a defense is appropriate. A final copy of the thesis proposal must be delivered to the members of the thesis committee at least two weeks in advance of the proposal defense. A copy of the thesis proposal must be available one week prior to the proposal defense by either submitting an electronic copy to the BIOMS administrative staff for redistribution, or by delivering a hard copy to each site supporting BIOMS faculty. Prior to the presentation, proposals that involve the use of human or animal subjects must receive approval from the University Institutional Review Board (IRB). Details for training, creating consent forms and submitting studies for review by the IRB can be obtained from the University of Delaware Research office.

The thesis proposal defense, will be open to the public, and invitations will be sent to all BIOMS faculty and students at least one week prior to the date of the defense. The candidate will present a summary of the proposed research, and will then field questions from the committee, attending faculty, and invited guests. After all questions have been fielded, the thesis committee will meet to decide whether the thesis proposal outcome was a pass, conditional pass, re-examination, or failure. Results of the meeting will then be presented to the student. The student may not receive more than one dissenting vote from members of the committee to receive a passing grade. Upon completion, the student is responsible for obtaining all the necessary signatures on the Thesis Proposal Defense Form. A signed copy of the form will be forwarded to the program director. Students who fail the thesis proposal defense will receive one additional opportunity to repeat the process and defend a new or modified thesis proposal at a time agreed upon by committee members, but within 6 months. If a student is ultimately unable to successfully defend their thesis proposal, the student may petition the BIOMS Executive Committee for admission to the MA program in Biomechanics and Movement science. Acceptance by the Executive Committee and a Change of Classification Form must be submitted and approved by the Graduate College.

## **3) Defense of the Thesis**

The format of the thesis must adhere to the University's Thesis and Dissertation Manual and style guidelines. These documents are available on the University's website. The thesis defense will be scheduled only after the chair of the thesis committee has determined that a defense is appropriate. A copy of the thesis proposal must be available one week prior to the proposal defense by either submitting an electronic copy to the BIOMS administrative staff for redistribution, or by delivering a hard copy to each site supporting BIOMS faculty.

The thesis defense will be open to the public, and invitations will be sent to all BIOMS faculty and students at least one week prior to the defense. The candidate will present a summary of the completed research, and will then field questions from the committee, attending faculty, and invited guests. After all questions have been fielded, the thesis committee will meet privately to decide whether the thesis is accepted, rejected, or accepted pending revisions. Results of the meeting will then be presented to the student. The student may not receive more than one dissenting vote from members of the committee to receive a passing grade. If a student is ultimately unable to successfully defend their thesis, the student may petition the BIOMS Executive Committee for admission to the MA program in Biomechanics and Movement science. Acceptance by the Executive Committee and a Change of Classification Form must be submitted and approved by the Graduate College.

#### **4) Processing the Final Document**

Students must follow the university approved step-by-step guidelines for graduation. The thesis must be approved by the Chair of the student's thesis committee, the Director of the Biomechanics and Movement Science program, and the Graduate College. Three original abstracts (on bond paper) must be submitted with the thesis. The thesis must be submitted to the Graduate College for approval not later than six weeks prior to the degree conferral date.

The University reserves the right to duplicate a thesis for distribution to other libraries or for the use of individual scholars. However, the University will not publish a thesis for general distribution without the written consent of the author. If copyrighting of a dissertation is desired, it may be arranged when the dissertation is submitted to the Graduate College. Published works are eligible for copyright protection in the United States if the work is first published in the United States.

#### **5) Grievance Procedures**

Students concerned that they have received an unfair evaluation or have been graded inappropriately may file grievances in accordance with student guide to University of Delaware policies. Students are encouraged to contact the BIOMS Graduate Program Director prior to filing a formal grievance in an effort to resolve the situation informally.

#### **C. Articulation Between Master's and Doctoral Degrees:**

The master's degree is considered terminal unless the student plans to continue in a doctoral program. Students receiving their master's degree at the University of Delaware are not eligible to remain classified as graduate students and are automatically reclassified CEND (Continuing Education Non-degree) in any subsequent semester that they register following degree clearance unless the department, with the approval of the Graduate College, has already admitted them into a doctoral program. The procedures for changing status after earning a master's degree are as follows:

If a master's degree candidate is continuing toward a doctoral degree in the same major as the master's degree, the student must request that the department submit a Change of Classification Form at the same time or before the student submits an Advanced Degree Application for the master's degree. If the department is unable to determine the student's eligibility to pursue a doctoral degree until after the master's degree is awarded, the department will notify the Graduate College by writing such a statement on the student's Advanced Degree Application for the master's degree. A student's classification changes from regular status in a master's degree program, to pre-candidacy when admitted to a doctoral program. If a master's degree candidate desires to continue toward a doctoral degree in a different major than the master's degree, the student should submit a completed admission application form to the Graduate College and follow the same procedure for admission as any other applicant.

### **Part IV. Academic Degree: Master of Arts (MA)**

#### **A. Degree Requirements for the Master of Arts (MA)**

##### **1) Pathway to MA**

The MA degree in Biomechanics and Movement Science is not a research degree requiring a research thesis. There is no direct entry into the Masters of Arts degree by new matriculating



students. Prospective students must petition the BIOMS Executive Committee for admission and a Change of Classification Form must be submitted and approved by the Graduate College. The MA degree is designed for entry by graduate students in the PhD or MS BIOMS programs that are unable to complete the research requirements because of one or more of the following reasons:

- Pursuing a research degree is no longer a career goal
- The faculty advisor is no longer willing or able to mentor them and no other mentor is available
- Failure to pass the PhD qualifying exam, the PhD dissertation proposal/defense or MS thesis proposal/defense
- Failure to earn a “B” grade or better in degree related coursework that cannot otherwise be remedied by modification of the plan of study
- Failure to make satisfactory progress
- Probationary status due to cumulative GPA falling below a 3.0
  - Requires the mathematical possibility of achieving a 3.0 GPA upon completion of degree related coursework

The BIOMS program recognizes that such students may have invested a year or more toward their respective degrees and may not find it desirable to seek transfer to another degree program. Thus, the MA degree provides an option to complete a master’s degree in BIOMS.

## 2) Program of Study:

Entry to the MA program requires immediate revision of the student’s prior BIOMS MS or PhD plan of study. The revised plan of study, created with their primary advisors requires approval by the BIOMS Executive Committee. Students must complete 24 credits of standard grading courses with a grade of “B” or better, plus 6 credits of a Capstone project to earn degree. Failure to earn a “B” grade or better in degree related coursework may be remedied by modification of the plan of study if possible. If ultimately modification of the plan of study is not possible and/or a 3.0 GPA is not attainable, the student will be de-enrolled from the university.

Required Courses (MA): 30 credits

- Statistics: 3 cr.
- Instrumentation: 3 cr.
- Research Methods Design/Analysis: 3 cr.
- **BMSC 622: Readings in Movement Science - Critically Evaluating the Literature:** 3 cr.
- Electives: 12 cr.
- **BMSC 865: Seminar:** 2 semesters, 0 cr.
- **BMSC 860: Capstone in Biomechanics and Movement Science:** 6 cr.

## 3) Independent Study and Transfer Credits

Students in the Master’s degree program are allowed to take a maximum of 6 credits of independent study. Additional independent study credits can be taken, but will not count towards graduation. A maximum of 9 credits earned at another U.S. institution may be applied to the Master’s degree if not used to complete a previous degree. Grades must be a “B” or better to be acceptable for transfer and no older than five years.

## 4) Changes to the Program of Study

Students may need to alter approved programs of study once matriculated into the program due to reasons that can include scheduling conflicts or the creation of new courses directly related to the student's goals. Students who wish to make changes to their program of study must obtain permission from their advisor and approval from the Executive Committee. Students may petition in writing for a variance in the degree requirements and must have approval from their faculty advisor and the BIOMS Executive Committee.

## **B. Committees for Capstone**

### **1) Establishment of Capstone Committee**

The student's advisor and prior qualifier or thesis/dissertation committee will serve as the Capstone Committee. If the student no longer has an advisor and/or other prior committee members are unwilling, other BIOMS faculty or the BIOMS Executive Committee will serve as the student's Capstone Committee.

### **2) Capstone Project**

The capstone project gives the candidate the opportunity to synthesize and apply the skills developed in the MA program, and to demonstrate mastery and knowledge and skills expected of a BIOMS MA graduate.

A culminating 6 credit Capstone project and integrative experience that examines a current topic in biomechanics and movement sciences, which may apply accumulated didactic knowledge for the experience. The written document will take the form appropriate for the type of project format the candidate is to undertake. For example, for an academic position paper, the degree candidate will survey the literature, write a report demonstrating proficiency and assimilation enabling formulation of a position statement or other type of integrative analysis. The candidate will make a public presentation to the department, represented by the Capstone Committee.

The format of the project will may be one of the following:

- Analytical Research/Process Focus (Ex: Academic Position Paper)
- Teaching Faculty Focus (Ex: Teaching Portfolio and Presentations)
- Research Technician Focus (Ex: Lab Manual)
- Other – must have approval from the student's advisor & committee and/or BIOMS Executive Committee prior to beginning project.

This degree will culminate in a capstone project consisting of seven parts:

1. Abstract or executive summary
2. Research question(s)
3. Review of the literature (academic and/or professional)
4. Analysis (quantitative and/or qualitative)
5. Findings
6. Recommendation
7. Oral presentation of the project

### **3) Presentation of the Capstone Project**

The Capstone presentation will be open to the public, and invitations will be sent to all BIOMS faculty and students at least one week prior to the defense. The candidate will present a summary of the completed project, and will then field questions from the committee, attending faculty, and invited guests. After all questions have been fielded, the thesis committee will meet privately to decide whether the project is accepted, rejected, or accepted pending revisions. Results of the

meeting will then be presented to the student. The student cannot receive more than one dissenting vote from members of the committee to receive a passing grade. Students who fail the Capstone will receive one additional opportunity to repeat the process and defend a new or modified project at a time agreed upon by committee members, but within 6 months.

#### 4) Grievance Procedures

Students concerned that they have received an unfair evaluation or have been graded inappropriately may file grievances in accordance with student guide to University of Delaware policies. Students are encouraged to contact the BIOMS Graduate Program Director prior to filing a formal grievance in an effort to resolve the situation informally.

#### C. Articulation between Master's and Doctoral Degrees

The Master of Arts degree is considered terminal for the BIOMS program. Students receiving their master's degree at the University of Delaware are not eligible to remain classified as graduate students and are automatically reclassified CEND (Continuing Education Non-degree) in any subsequent registered semester following degree clearance unless the department, with the approval of the Graduate College, has already admitted them into a doctoral program other than BIOMS. The procedures for changing status after earning a master's degree are as follows: If a master's degree candidate desires to continue toward a doctoral degree in a different major than the master's degree, the student must submit a completed admission application form to the Graduate College and follow the same procedure for admission as any other applicant.

### Part V. Academic Degree: Doctor of Philosophy (PhD)

#### A. Degree Requirements for a PhD in Biomechanics and Movement Science

##### 1) Program of Study:

All accepted students must submit a planned program of study by the end of their first semester, created with their primary advisor(s) to be approved by the BIOMS Executive Committee. Students must complete 33 credits of standard grading courses with a grade of "B" or better, plus 9 credits of dissertation to earn degree. Failure to earn a "B" grade or better in degree related coursework may be remedied by modification of the plan of study if possible. If a student is ultimately unable to successfully modify their plan of study, the student may petition the BIOMS Executive Committee for admission to the MA program in Biomechanics and Movement science. Acceptance by the Executive Committee and a Change of Classification Form must be submitted and approved by the Graduate College.

Required Courses (PhD): 42 credits

- Statistics: 3 cr.
- Instrumentation: 3 cr.
- Research Methods Design/Analysis: 3 cr.
- **BMSC 622: Readings in Movement Science - Critically Evaluating the Literature:** 3 cr.
- Electives: 21 cr. (including BMSC 866 and BMSC 868)
- **BMSC 865: Seminar:** 3 semesters, 0 cr.
- **BMSC 969: Doctoral Dissertation:** 9 cr.

##### 2) Independent Study, Research and Transfer Credits

Students in the Doctoral degree program are allowed to apply a maximum of 12 credits of

combined independent study (BMSC 866), and research (BMSC 868), where no more than 6 credits may be research. Additional independent study credits can be taken, but will not count towards the required 33 credits for graduation. A maximum of 9 graduate credits earned at another U.S. institution may be applied to the Doctoral degree if not used to complete a previous degree. Grades must be a “B” or better to be acceptable for transfer and not older than five years.

### **3) Changes to the Program of Study**

Students may need to alter approved programs of study once matriculated into the program due to reasons that can include scheduling conflicts or the creation of new courses directly related to the student’s goals. Students who wish to make changes to their program of study must obtain permission from their advisor and approval from the Executive Committee. Students may petition in writing for a variance in the degree requirements and must have approval from their faculty advisor and the BIOMS Executive Committee.

### **4) Residency Requirements**

At least 4 academic years of graduate work are normally required for the Ph.D. degree. At least one continuous academic year must be devoted exclusively to full-time study in the major field in residence at the University of Delaware. Students holding assistantships are considered full-time with 6 credits, and students holding fellowships are considered full-time with 9 credits. This residency requirement may be fulfilled using a fall and spring semester combination or a spring and fall semester combination, but summer or winter sessions do not meet the qualification. Course credit earned in a master's program at the University of Delaware may be applied toward the doctoral degree residency requirement if the candidate is receiving both degrees from the University in the same major field.

### **5) Registration Requirements Prior to Doctoral Candidacy**

Course registration requirements are determined by the student's approved program of study. Once the student has registered for all course requirements in a program of study but has not yet met all of the stipulations for passing into candidacy, the student must maintain registration during the fall and spring semesters in course(s) or in 3-12 credits of Pre-Candidacy Study (964). Pre-Candidacy Study is graded pass/fail. If the student registered in Pre-Candidacy Study is admitted to candidacy before the end of the free drop/add period of the next semester, the registration in Pre-Candidacy Study for the preceding semester may be changed to the course, Doctoral Dissertation (969) by the Graduate College.

## **B. Biomechanics and Movement Science PhD Professional Tracks**

### **1) DPT/PhD**

University of Delaware Physical Therapy (UDPT) is committed to training outstanding rehabilitation research scientists. In an effort to facilitate this commitment, a competitive funding opportunity is available in the first and/or second year Doctor in Physical Therapy (DPT) students who plan to pursue a PhD at the completion of their DPT. These students will continue into the PhD [Biomechanics & Movement Sciences](#) (BIOMS) Program, pending successful application, with support from PT faculty research grants, or a training grant from the National Institutes of Health (NIH). This NIH training grant is led by Lynn Snyder-Mackler, PT, ATC, Sc.D, SCS, FAPTA. Its goal is to improve the quality and quantity of individuals who conduct excellent research studies on the problems of people with disabilities. Graduates of this program will possess the skills necessary to contribute significantly to the knowledge base and practice in the field of physical rehabilitation.

This innovative training program, coordinated through UDPT, includes outstanding faculty members from several academic units within the Colleges of [Arts & Sciences](#), [Engineering](#), and [Health Sciences](#) at the University of Delaware. The program fuses two independent training programs: an entry level DPT, designed to train clinical physical therapists, and the PhD in Biomechanics and Movement Sciences (BIOMS). Prior DPT/PhD graduate students designed their PhD studies to focus on their research interests, which have included Applied Anatomy & Physiology, Biomechanics, Cytomechanics, Motor Control/Behavior, and Clinical & Translational Science.

The program is analogous to the MD/PhD programs that are designed to train medical scientists. Students in the proposed program will become both physical therapists and research scientists. Graduates of this training program are renowned faculty members and foster excellence in rehabilitation research.

## **2) Prosthetics-Orthotics Clinical Practice and Biomechanics and Movement Science PhD Dual-Training Track**

This track recognizes the need for clinician scientists in the field of prosthetics and orthotics, i.e., individuals who are board-certified as prosthetists and/or orthotists but also have training commensurate for an independent line-of-research. These clinician scientists will help to fill the current gaps in scientific inquiry, peer review, product development and testing, within the field of prosthetics and orthotics. This concentration is a collaborative effort between the University of Delaware and the private sector. A private sector entity (e.g. prosthetics and/or orthotics practice) provides a National Commission on Orthotic and Prosthetic Education-accredited clinical residency in prosthetics or orthotics to fulfill the requirements for board-certification in either prosthetics or orthotics through the American Board for Certification. Concurrently, upon successful completion of certification, the University of Delaware's Interdisciplinary Graduate Program in Biomechanics and Movement Science (BIOMS) provides training required for success as an independent and funded investigator in the field of prosthetics and orthotics. Residency and subsequent mentorship as a junior-clinician through an assistantship within the private sector, coupled with concurrent research training through the BIOMS program, provides a pathway for students who have a Master's degree in Orthotics and Prosthetics from a Commission on Accreditation of Allied Health Education Programs-accredited Orthotics and Prosthetics Program (or the foreign degree equivalent) to secure clinical skills and competencies, while garnering knowledge and abilities required for impactful research.

### **a. Special Competencies Needed**

Admission decisions are made by the Executive Committee of the Biomechanics and Movement Science Program. Deficiencies in more than two areas of the below requirements will automatically result in an admission denial by the Executive Committee. Students will be admitted to the program based upon enrollment availability and their ability to meet the following minimum recommended entrance requirements.

- Master's degree in Orthotics and Prosthetics from a Commission on Accreditation of Allied Health Education Programs-accredited Orthotics and Prosthetics Program (or the foreign degree equivalent)
- Acceptance by a primary advisor
- Private sector entity to provide clinical residency training
- A undergraduate GPA of 3.0 or higher
- Pre-requisites with a grade of "B" or better in:
  - Calculus
  - Anatomy/Physiology
  - Mix of Laboratory Science courses and/or courses most applicable to the individual's planned area of research (12 credits)

- Submission of GRE scores is optional

### **C. Qualifying Examination for the BIOMS PhD Program**

Students will be required to successfully complete a Qualifying Examination, containing both written and oral components, after the end of the second full semester in the program. The exam will be evaluated by a committee of 3 faculty members and graded as Pass, Conditional Pass, or Fail. The Qualifying Exam must be completed by the end of the third full (not including winter or summer terms) academic semester, including remediation.

#### **1) Eligibility**

Following the semester in which the student completes at least 12 graduate credits of their required coursework and at least 2 full semesters of study: the summer following the first year of study for Fall semester matriculation, the winter following the first year of study for Spring semester matriculation: they will be eligible to proceed with their Qualifying Exam. For students with non-fall matriculation or part-time study, the timing of the Exam will be determined by course completion (i.e., two semester equivalent) and the approval of the BIOMS Director. For students enrolled in the Prosthetics-Orthotics Clinical Practice and Biomechanics and Movement Science PhD Dual-Training Track, they will be eligible to proceed with their Qualifying Exam after completing at least 18 graduate credits of their required coursework and at least 3 full semesters of study. To take the Examination, each student must be in good academic standing and have approval of the faculty advisor.

#### **2) Qualifying Examination Committee Membership**

The Qualifying exam committees will be made up of 3 members, selected by the BIOMS Executive Committee, to include:

- a. Student's advisor
- b. One BIOMS faculty member who has some content expertise relevant to at least one aspect of the students proposed research area
- c. One BIOMS faculty member who would be considered outside the student's primary research area/expertise.

\* Members of the Qualifying Exam committee may also become members of the student's dissertation committee, but this is not required.

#### **3) Scheduling of the Oral Qualifying Exam**

No later than the end of the first week of the Summer term (Fall admit) or Winter term (Spring admit), the student will submit to their advisor and the BIOMS Director a document title and brief description of the subject matter proposed for the Exam. This will help guide the Executive Committee's selection of Qualifying Exam committee members. After submission of the topic description, the student will be given 8 weeks to complete and submit the written component of the Exam. After the written exam has been evaluated, a 90 minute oral examination will take place with the same committee that evaluated the written document. Oral exams are typically scheduled for the week or two before the fall semester starts. Students will be expected to maintain participation in their regular research activities while preparing for the written and oral examinations. Students and their advisors may petition the BIOMS Director and Executive committee for an extension of the Qualifying exam if unforeseen circumstances arise that prevent timely completion. For students with non-fall matriculation or part-time study, the timing of each component of the Exam will be determined by the BIOMS Director, in consultation with the Qualifying Exam committee.

#### 4) Qualifying Exam Components

The purpose of the Qualifying Exam is to evaluate the preparation of the student in the areas of background knowledge, methods and techniques, critical thinking, and oral and written scientific communication. These criteria will be evaluated through both a written exam and an oral exam. The oral comprehensive exam will include three areas designed to test the student's general knowledge base in biomechanics and movement science, the area of study that is consistent with the student's planned dissertation work, research methodology, and their ability to critically evaluate scientific literature. The examination is organized and administered by the advisor in consultation with the student's committee.

##### **b. Written Component**

The written exam requires the student to prepare a 5-7-page document, consisting of the following:

- A literature review establishing the Background and Significance of a proposed area of research;
- A Summary of Important Methodologies, Measurements, Analyses, and Outcomes from the proposed area of research, together with their strengths and weaknesses;
- An identification and expansion upon at least one Important Gap in the Current Knowledge that could be addressed through their future research;
- A separate Works Cited section (no page limit)

This document should be formatted as follows:

- No less than 0.5-inch margins (top, bottom, and sides);
- Single spaced;
- Font no smaller than 11pt;
- Arial, Georgia, Helvetica, or Palatino Linotype font suggested;
- Correct citation style, conforming to the current NIH SF424 guide requirements and the standards of the student's field of study, should be used throughout.

This document can be (but does not have to be) a draft of the introduction, background and significance, and methods sections of the student's future dissertation and of papers anticipated to arise from their dissertation research.

Students may consult their advisor, other faculty members, and other students regarding the development of the scientific question to be the focus of the work. However, the preparation of this work and the writing must be the student's original and independent work. That is, unpublished works completed by or in collaboration with an advisor (abstracts, drafts or manuscripts or grants) may not be used. Any text or figures used from published source (including previously published works by the student and/or advisor) must be properly cited. Failure to do so would constitute plagiarism.

The Qualifying Exam committee will evaluate the written exam to determine (1) whether the student demonstrates an acceptable knowledge of the scientific background and techniques relevant to their topic and (2) whether the student demonstrates written scientific communication skills expected of a student completing the first year of a BIOMS Ph.D. program.

Along with submission of the written document, the student will also submit to the Qualifying Exam committee a copy of their current Plan of Study and syllabi from each of the courses completed to date. The committee will have a standardized rubric to evaluate the written exam and will provide the student with formal written feedback on the written exam prior to the oral exam date. This feedback will be provided 2 weeks prior to the scheduled oral exam.

### **c. Oral Component**

The student will prepare a 15-minute oral presentation based on the key components of their written exam and may address written feedback provided by their committee. Following the presentation, there will be one hour and 15 minutes for questions, which will be divided between items relating to the written exam content, obtaining responses to the feedback from written exam, and questions on general biomechanics and movement science knowledge based on the student's completed core and elective courses.

## **5) Qualifying Exam Results**

The Qualifying Examination Committee will submit a recommendation to the BIOMS Executive Committee that the student either 'Pass', 'Conditionally Pass' or 'Fail' the Qualifying Exam. The recommendation will reflect the committee consensus opinion:

- a. Pass:** A decision of 'Pass' means that the committee feels that the student's preparation is adequate to continue their work toward the candidacy stage.
- b. Conditional Pass:** A decision of 'Conditional Pass' indicates that the committee believes the student is not currently, but will be able to, successfully complete dissertation-level research, after successfully completing additional education or training within no longer than one additional semester. When completed, the student will be able to be successful in independent dissertation-level research. If the committee recommends a student's Conditional Pass, they should also prepare a proposed study and mentoring plan to address any identified areas of weakness or insufficient preparation. The qualifying exam committee will review the student's additional education or training outcomes and make recommendations to the Executive Committee for passing or failing the conditional status.
- c. Fail:** A decision of 'Fail' means that the committee feels that the student's present areas of weakness and/or insufficient preparation are significant enough to prevent the student from successfully achieving programmatic milestones necessary to demonstrate and complete independent dissertation-level research, and that these deficiencies cannot be corrected within the timeframe set by the Graduate Program (by the end of the third full semester) for accomplishing these milestones.

The recommendation of the Qualifying Examination Committee will be reviewed by the Executive Committee, who will make final decisions. The BIOMS Director will communicate the decision to the student and provide and retain a written copy of the study and mentoring plan, if applicable. Progress made on the study and mentoring plan shall be documented on subsequent periodic reports, in line with specifications made in the plan and consistent with the requirement to complete the plan within one semester. Inadequate progress in the study and mentoring plan recommended by the committee may be grounds for dis-enrollment from the PhD program.

If the student fails the exam, they will be dis-enrolled from the PhD program, but may qualify to complete a Non-thesis Masters of Arts degree in Biomechanics and Movement Studies, which requires a total of 30 credits. Alternatively, the student may petition their advisor and the BIOMS Executive Committee for admission into the BIOMS Masters of Science degree program, which requires a thesis and the commitment of a willing advisor. Students concerned that they have received an unfair evaluation or have been graded inappropriately may file grievances in accordance with the student guide to University of Delaware policies. Students are encouraged to contact the BIOMS Graduate Program Director prior to filing a formal grievance in an effort to resolve the situation informally.



#### **D. Admission to Doctoral Candidacy**

The University requirements for admission to doctoral candidacy are that the student has (1) had a Plan of Study approved, (2) completed one academic year of full-time graduate study in residence at the University, (3) fulfilled the foreign language requirement, if any, (4) passed the Qualifying Examination, (5) shown the ability to do research, and (6) had a research project accepted by the advisory committee with human/animal subjects approval (if appropriate for the research).

For BIOMS PhD students, successfully defending the Dissertation Proposal (described below), serves as the final acceptance of the research project. When a student has met the requirements for admission to candidacy, the Recommendation for Candidacy for Doctoral Degree should be completed and submitted.

#### **E. Continuous Progress towards Degree Completion**

The student's progress in the program must be reviewed with the advisor on an annual basis. The student is responsible for completing an Individualized Development Plan (IDP), which will be evaluated and maintained by their advisor. Students must develop goals with their faculty advisor on an annual basis to ensure students are progressing appropriately throughout the program and must also satisfy all the requirements for academic progress as specified in the academic progress policy guidelines. Modifications to the IDP to address any shortcomings in academic preparedness should be made on an as needed basis. Failure to make satisfactory progress towards degree requirements and time limits for completion could result in dismissal from the program.

#### **F. Regulations Governing Dissertations**

##### **1) Establishment of Dissertation Committee**

The student and their advisor will create a dissertation committee at the time the student begins to develop the dissertation proposal. The dissertation committee shall include at least three University faculty from within the Biomechanics and Movement Science Program, and at least one member from outside of the program. The dissertation advisor must be a member of the BIOMS faculty, and at least one of the BIOMS committee members must be from an area of focus in biomechanics and movement science different than that of the advisor. With the approval of the BIOMS Executive committee, one professional staff member who holds a secondary faculty appointment within an academic department may serve as a committee member. However, all three within-program committee members must hold the doctoral degree. Faculty who have retired or resigned from the University may maintain committee membership or continue to chair committees of students whose work began under their direction prior to their retirement or departure from the University. Non-tenure BIOMS faculty may co-advise BIOMS students and co-chair the dissertation committee provided that the other co-advisor/co-chair is a tenure track BIOMS faculty member. Outside committee members must hold a doctoral degree, and shall include individuals not affiliated with the Biomechanics and Movement Science Program. These may be individuals from outside of the University who are nationally recognized for their expertise in the area of study specified by the dissertation. The BIOMS Director must approve committee members from outside of the University. It is the responsibility of the dissertation advisor to replace members who withdraw from the committee during the dissertation process.

##### **2) Defense of the Dissertation Proposal**

The dissertation proposal includes both a proposal for a research project as well as a career development plan. The proposal document is to be written generally in the format of an NIH F31 (pre-doctoral) training grant, with some exceptions (described below).

- **Part 1. Research Project Proposal (“the science”)**
  - Specific Aims (max, 1 page)
  - Research Strategy (no page limit)
  - Works Cited (no page limit)
- **Part 2. Individual Development Plan (IDP, “the career development plan”)**
  - Respective Contributions (max, 1 page)
  - Selection of Sponsor and Institution (max, 1 page)
  - Doctoral Dissertation and Research Experience (max, 2 pages)
  - Training Goals and Objectives (max, 2 pages)
  - Activities Planned (max, 2 pages)

The dissertation proposal defense will be scheduled only after a majority of members of the dissertation committee have determined that a defense is appropriate. A final copy of the dissertation proposal must be delivered to the members of the dissertation committee at least two weeks in advance of the proposal defense. A copy of the dissertation proposal (not including the IDP) must be available one week prior to the proposal defense by either submitting an electronic copy to the BIOMS administrative staff for redistribution, or by delivering a hard copy to each site supporting BIOMS faculty. Prior to the presentation, proposals that involve the use of human or animal subjects must receive approval from the University Institutional Review Board (IRB). Details for creating consent forms and submitting studies for review by the IRB can be obtained from the University of Delaware Research Office.

The Dissertation proposal defense will be open to the public, and invitations will be sent to all BIOMS faculty and students at least one week prior to the defense date. The candidate will present a summary of the proposed research, and will then field questions from the committee, attending faculty, and invited guests. After all questions have been fielded, the dissertation committee will have a closed session with the student, which will focus on the research proposal as well as the IDP. Finally, the committee will meet to decide whether the proposal is accepted, rejected, or accepted with conditions. Results of the meeting will then be presented to the student. The student may not receive more than one dissenting vote from members of the committee to receive a passing grade.

Dissertation committee members will sign the final copy of the approved proposal and the candidacy form. A signed copy of the approved dissertation proposal should be forwarded to the program director. Students who fail the dissertation proposal defense will receive one additional opportunity to repeat the process and defend a new or modified dissertation proposal. If a student is ultimately unable to successfully defend their proposal, the student may petition the BIOMS Executive Committee for admission to the MA program in Biomechanics and Movement science. Acceptance by the Executive Committee and a Change of Classification form must be submitted and approved by the Graduate College.

### **3) Defense of the Dissertation:**

The format of the thesis must adhere to the University’s Thesis and Dissertation Manual and style guidelines. A copy of the dissertation must be available one week prior to the dissertation defense by either submitting an electronic copy to the BIOMS administrative staff for redistribution, or by delivering a hard copy to each site supporting BIOMS faculty. The dissertation defense will be scheduled only after the advisor of the dissertation committee has determined that a defense is appropriate.

The dissertation defense will be open to the public, and invitations will be sent to all BIOMS

faculty and students at least one week prior to the defense date. The candidate will present a summary of the completed research, and will then field questions from the committee, attending faculty, and invited guests. After all questions have been fielded, the dissertation committee will meet to decide whether the dissertation is accepted, rejected, or accepted pending revisions. Results of the meeting will then be presented to the student. The student may not receive more than one dissenting vote from members of the committee to receive a passing grade. If a student is ultimately unable to successfully defend their dissertation, the student may petition the BIOMS Executive Committee for admission to the MA program in Biomechanics and Movement science. Acceptance by the Executive Committee and a Change of Classification Form must be submitted and approved by the Graduate College.

#### **4) Processing the Final Document**

Students must follow the university approved step-by-step guidelines for graduation. The University reserves the right to duplicate a dissertation for distribution to other libraries or for the use of individual scholars. However, the University will not publish a dissertation for general distribution without the written consent of the author. If copyrighting of a dissertation is desired, it may be arranged when the dissertation is submitted to the Graduate College. Published works are eligible for copyright protection in the United States if the work is first published in the United States.

### **Part VI. Assessment Plan**

The BIOMS program will follow the Academic Program Review (APR) schedule, policies and procedures, established by the Provosts office and faculty senate. Data will be provided by the Office of Institutional Research and Effectiveness, in conjunction with faculty/student interviews, measures of scholarly productivity, alumni surveys and national ranking when available. Annual meetings will be held to discuss curricular changes, course learning objectives, review analyzed data, identify action items, and establish timelines and assignments for responsibilities. The BIOMS program will continue consultation with the Center for Teaching and Assessment of Learning to periodically reexamine appropriate learning outcomes, assessment criteria, and benchmarks for success.

### **Part VII. Financial Aid**

#### **A. Financial Assistance**

Financial assistance for students in the BIOMS program is obtained from a variety of sources and will therefore vary in form and availability. Assistance will be awarded on a competitive basis to applicants' best fitting the needs of the granting agencies and sponsoring faculty. Students receiving full stipends will be expected to work up to 20 hours per week on contract responsibilities and students are expected to maintain full-time student status.

#### **B. Tuition Semesters**

When available, requests for tuition semesters must be submitted by the faculty advisors to the BIOMS Executive Committee for approval. The requests must include the following:

- Student Name:
- Current GPA:
- Number of credits completed/remaining:
- Degree (MS or PhD):
- Number of semesters enrolled:
- Estimated number of semesters until completion of degree:
- Number of tuition semesters requested:

- Rationale for requesting block tuition line:
- Plan to secure funding for future semesters, if applicable:

### **C. University of Delaware Dissertation and Graduate Fellows Awards.**

Applications for the University of Delaware Dissertations and Graduate Fellows Awards must follow the Graduate College guidelines, and be submitted for approval to the BIOMS Executive Committee at least 2 weeks prior to the announced deadlines. These are competitive and merit based awards with limited submissions permitted from each program.

## **PART VIII. General Information Relevant to Both Master's and Doctoral Degree Candidates**

### **A. Graduate Course Numbering System**

Graduate credit may be earned for courses numbered 600 to 699, 800 to 898, and 900 to 998. With the approval of Biomechanics and Movement Science Executive Committee, 500-level courses taken outside the student's major department may be applied toward a graduate degree.

### **B. Advanced Degree Application**

To initiate the process for degree conferral, candidates must submit an Advanced Degree Application to the Graduate College prior to the published deadline for the desired degree conferral term. No coursework to earn a prior degree may be used for the advanced degree application.

### **C. Academic Good Standing**

To be considered in good academic standing, a student must maintain a minimum cumulative graduate grade point average (GPA) of 3.00 on a 4.00 scale each semester. To be eligible for an advanced degree, a student' cumulative grade point average shall be at least a 3.00 and the student's grades in courses counted toward the degree requirements of the program shall equal at least a 3.00.

### **D. Academic Probation**

The Office of Graduate Studies monitors the academic progress of all graduate students and notifies students in writing of all academic deficiencies. The cumulative GPA after each 9-hour increment determines academic standing. In addition to the University policy regarding minimum grade point average, some departments require graduate students to maintain certain performance minima in their program of study in all or in particular courses. Failure to meet the standard minima may lead to academic dismissal from the program.

### **E. Satisfactory Progress toward a Graduate Degree**

If a graduate student fails to make satisfactory progress toward all degree requirements, permission may be denied to continue in the degree program. At the close of each semester, winter session, or summer session, in those circumstances deemed appropriate by the Graduate Director exercising their professional judgment, the Executive Committee of the BIOMS program may evaluate the progress of a graduate student toward meeting the academic standards of the program in which the student is enrolled. In addition to graded course work, academic standards include, but are not limited to, professional, ethical, clinical, and other standards required of graduate students.

Students are entitled to know the procedures and standards by which their academic performance is assessed. If, in the professional judgement of the Executive Committee, a student has failed to make satisfactory progress toward meeting the academic standards of the program in which that student is

enrolled, the Executive Committee may vote to dismiss that student from the program.

In the case of dismissal, the Program Director is required to send a report to the Graduate College that states the faculty vote on the decision causing dismissal and the justification for this action. The Graduate College will notify a student in writing when the student is being dismissed for failure to make satisfactory progress in the program. The student may appeal the termination by writing to the Graduate College. This appeal must be made within 10 class days from the date on which the student has been notified of academic dismissal. The Graduate College will review the appeal and may either uphold the dismissal, grant reinstatement, or refer the case to the Graduate Hearing Board for resolution. If the Graduate College grants reinstatement, the student must meet the conditions of the reinstatement. Failure to meet these conditions will result in dismissal from the program. A graduate student may be reinstated only once to a given major. The student's academic transcript will reflect the reinstatement with the appropriate academic probation status.

#### **F. Time Limits for the Completion of Degree Requirement.**

Time limits for the completion of degree requirements begin with the date of matriculation

- Students entering a PhD program with a MS degree are given 10 consecutive semesters to complete the requirements.
- Students entering a PhD program without a MS degree are given 14 consecutive semesters to complete the requirements.
- Students who change their degree plan and have transferred from one degree program to another are given 10 consecutive semesters from the beginning of the first year in the latest program.

#### **G. Extension of the Time Limit**

Requests for time extensions must be made in writing and approved by the student's advisory committee, chair of the department's graduate committee, and the BIOMS Executive Committee. The department will forward the request to the Graduate College. The Graduate College will determine the student's eligibility for a time extension and will notify the student in writing of its decision to grant an extension of time.

#### **H. Sustaining Status for Candidates Pursuing Thesis/Dissertation Degree Option**

Once a graduate student who is completing a thesis/dissertation option has completed all required course credits needed for the degree (including 6 credits of Master's thesis [869] or 9 credits of dissertation [969]) and all other degree requirements except the submission of thesis or dissertation, the student is required to maintain their matriculation in the degree program by registering for either Master's Sustaining: Thesis (UNIV 899) or Doctoral Sustaining (UNIV 999). All students, including sustaining students, are required to be registered in the semester in which the degree is officially awarded. Sustaining registration is required for summer session if the student complete the degree in summer session.

#### **I. Transfer of Graduate Credit**

Graduate credit earned at another institution will be evaluated at the written request of the student. Such a request must be submitted to the director of the BIOMS program using a Request for Transfer of Graduate Credit form. A maximum of 9 credits required for the degree will be accepted provided that such credits:

- Were earned with a grade of no less than "B",
- Are approved by the student's adviser and the BIOMS Director
- Are in accord with the student's approved plan of study,

- Are not older than five years, and
- Were completed at an accredited college or university.

The credits, but not the grades or quality points, are transferable to University of Delaware graduate records. Graduate courses counted toward a degree received elsewhere may not be used. Credits earned at another institution while the student was classified as a continuing education student at that institution are not eligible to be transferred to one's graduate degree at the University of Delaware. Credits from institutions outside of the United States are generally not transferable to the University of Delaware.

***J.* Expiration of Credit**

Course credits expire 5 years after the course has been completed.