The information provided in this document serves to supplement the requirements of the Graduate School of Biomedical Sciences detailed in the UNTHSC Catalog with requirements specific to the discipline of Structural Anatomy and Rehabilitation Sciences.
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Structural Anatomy and Rehabilitation Sciences Discipline

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Graduate Faculty: Bugnariu; Lovely; Maddux; Menegaz; Miller; Patterson; Reeves.

The Structural Anatomy and Rehabilitation Sciences (SARS) discipline is a collaborative, inter-professional discipline offered by the Center for Anatomical Sciences and the Department of Physical Therapy. Our discipline offers both M.S. and Ph.D. degrees aligned with research opportunities, coursework, and teaching experiences. These activities are designed to develop and train students who will be qualified to serve as faculty members and independent researchers in various departments at health science centers and universities. The discipline will focus on anatomy, biomechanics, and movement science using advanced experimental, computational, and clinical tools. The major impetus of the research in the discipline will consist of but not be limited to: 1) biomechanics, including the study of the structure, function, evolution/adaptive significance, and mechanical behavior of musculoskeletal soft and hard tissues, 2) neuroscience of movement production, learning and control; 3) anatomical studies linked to clinical applications in orthopedics and physical therapy, 4) the analysis, design, and/or development of rehabilitation protocols, assessment tools and techniques, assistive devices and instrumentation used in rehabilitation practice, 5) studies of educational pedagogy in anatomy/movement science through the development of novel educational tools, techniques, and assessment strategies.

All students entering the discipline will complete an integrated biomedical science core curriculum that includes fundamental principles of biochemistry, cellular and molecular biology, microbiology and immunology, pharmacology, physiology, and neurobiology. Beginning with the second semester, students will enroll in additional elective courses for the discipline such as Applied Biomechanics, Principles of Movement and Motor Control, or anatomy systems courses, to be completed during their graduate career. Students are required to participate in seminar/work in progress and journal club for their first two years. Students will conduct original, publishable research and will be expected to present their results at national scientific conferences. The completion of the M.S. degree typically requires two to three years; the Ph.D. degree is generally completed in four to five years.

Graduates with advanced degrees typically find employment in higher education, industry and government agencies.
Structural Anatomy and Rehabilitation Sciences Discipline

Nicoleta Bugnariu, PhD and DPT  
Associate Dean of Academic Affairs and Research - School of Health Professions  
Professor  
Category III

Dr. Nicoleta Bugnariu is a licensed Physical Therapist and holds a PhD in Neuroscience. Dr. Nicoleta Bugnariu’s research focuses on the underlying mechanisms controlling sensorimotor function in patients across the lifespan. She has research expertise in motor control and neuroscience and has worked clinically with patients with neurologic conditions, in particular stroke patients and frail elderly at risk of falls. Line of research are grouped under the following topics: i) Age-related changes in systems involved in postural control, ii) Balance rehabilitation and falls prevention, iii) Sensory integration and hearing loss impact on balance control, iv) Virtual reality, robotic and prosthetic technologies used as evaluation and rehabilitation tools. Dr. Bugnariu conducts her research in the Human Movement Performance laboratory at UNTHSC where she has been effective at building a network of collaborators, a diverse team of researchers and clinicians with complementary expertise in physical therapy, neuroscience, geriatrics, biomechanics, kinematics, robotics, cognitive psychology, and biomedical engineers. Dr. Bugnariu has a record of positive mentorship and is fully committed to the successful career of her trainees.

Dr. Howe Lui, PT, MS, MD, PhD  
Professor, Physical Therapy  
Category III

Dr. Liu has spent his research career in neuroscience, anatomy and physical therapy, but in last 18 years his research centers more on balance improvement and fall prevention among older individuals (primarily) and clinical anatomy of the musculoskeletal system in Gross Anatomy lab (secondarily). More specifically, he has led his geriatric research group (faculty members, PhD and DPT students) with focuses on 1) effects of inappropriate use of assistive ambulatory devices (AADs) on gait, balance, and posture; 2) interventions with combination of physical therapy exercise and Chinese medicine to improve gait, balance, strength, and posture in general older population, AAD users, and patient-specific older population; and 3) bioengineering modification and testing of assistive ambulatory devices.

Dr. Liu is a very active in providing community services to local senior living communities. As a faculty member, he and his team had provided geriatric rehabilitation related community services to local senior living communities in central Arkansas area (2003-2009) and in DFW metropolitan area (2010 – now).
Rehana Lovely, Ph.D.
Assistant Professor, Department of Physiology and Anatomy
Center for Anatomical Sciences
Category II

Dr. Lovely’s research broadly focuses on collaborating with physical therapists, surgeons and other clinicians to investigate human anatomical variations, mapping of surface projection of the peripheral nerves and pathophysiology of myofascial pain. I am also interested in anatomy education research involving community outreach programs and medical student education.

Scott D. Maddux, Ph.D.
Assistant Professor, Department of Physiology and Anatomy
Center for Anatomical Sciences
Category III

My research focuses on human evolution during the Middle and Late Pleistocene with an emphasis on Neandertal and modern human craniofacial anatomy. In particular, I am interested in the developmental, biomechanical, and stochastic processes which produced the characteristic midfacial prognathism of Neandertals and orthognathism of modern humans. Related to these issues, I have corollary interests in patterns of human craniofacial allometry, integration, sexual dimorphism, and eco-geographic variation. To investigate these topics, my laboratory employs multiple techniques and approaches, including medical imaging and laser scanning modalities, linear and geometric morphometrics, and experimental modeling in non-human species. Current research projects are primarily concentrated in two main areas; the influence of climatically-adaptive variation in human upper respiratory tract anatomy on overall craniofacial morphology; and the “self-domestication” hypothesis as a model for explaining facial retraction as an evolutionary byproduct of selection for increased social tolerance.
Rachel Menegaz, Ph.D.
Assistant Professor, Department of Physiology and Anatomy,
Center for Anatomical Sciences
Category III

My research explores the growth and function of the mammalian masticatory apparatus. The biomechanical demands imposed by dietary composition are known to affect chewing behavior and joint kinematics and, over time, the growth trajectories of the craniofacial skeleton and its associated soft tissues (joint cartilages, muscles of mastication, etc.). By modulating diet, we are able to affect the overall growth of these tissues, dental eruption and occlusion, and even the biomineralization of the masticatory skeleton and fiber type composition of masticatory muscles. I am particularly interested in how early life history events (such as weaning and dental eruption/replacement) affect feeding, growth, and adult morphological outcomes. Current research themes include: (1) Variation in maturation rates among tissues of the masticatory complex and how this affects feeding performance and plasticity. What happens during the transition between infant-like suckling and adult-like chewing, and what are the structural and behavioral constraints that limit efficient feeding during early childhood? (2) The role of type I collagen in the growth of the craniofacial skeleton. How do collagen disorders, such as osteogenesis imperfecta, affect the facial phenotype? What behavioral and/or pharmaceutical interventions are effective in recovering the phenotype and function in these disorders?

Haylie L. Miller, Ph.D.
Assistant Professor, Department of Physical Therapy
Category III

The Autism and Developmental Disorders Research Team has NIH and NSF grant support for a program of research investigating visuomotor integration—the use of visual information to plan, execute, and modify movement—in Autism Spectrum Disorder (ASD). Visuomotor integration is important for many tasks of daily living, like making a sandwich, walking or playing sports, and driving a car. People with ASD have known differences in eye and body movement. Some people with ASD may also receive a diagnosis of Developmental Coordination Disorder because of the level of difficulty they have with movement and coordination. We seek to understand how the visual and motor systems work together to produce functional behaviors. Some of these behaviors include walking, aiming, and moving the body to intercept or avoid objects. To answer questions about how people with ASD might be different from people without ASD, or from people with other developmental disorders like DCD, we use neuropsychological assessments, motor assessments, vision screening, mobile eye-tracking, full-body motion-capture, and force plates. We use several different 3D environments to test visuomotor integration under conditions that simulate real-world demands on attention and performance. We also conduct retrospective studies of motor and visual symptoms of ASD using secondary datasets and electronic medical records from local and national sources.
Rita M. Patterson, PhD  
Professor, Department of Family and Osteopathic Manipulative Medicine.  
Category III

My background is in biomedical engineering, with specific training and expertise in applied research in Orthopaedics, human performance, and rehabilitation. I have a unique perspective that can bridge and facilitate technology development in clinical settings and applications. In the department of Orthopaedic Surgery and Rehabilitation at the University of Texas Medical Branch in Galveston TX, I had a successful partnership for 20 years with a hand surgeon investigating the anatomic, biomechanic and kinematics of the carpal bones and the upper extremity. I also worked closely with upper extremity physical therapists and rehabilitation science specialists to understand hand function. At UNTHSC, Dr. Patterson works in the Human Movement Performance laboratory. This lab is devoted to improving knowledge of musculoskeletal function in order to assist physicians in the diagnosis and treatment of medical problems. The goals include improved clinical measurements of biomechanical function, objective methods of evaluation, treatment, and therapy, and mathematical/computer models of muscle, joint, and bone mechanics.

Rustin E. Reeves, PhD  
Professor, Department of Physiology and Anatomy and Director  
Center for Anatomical Sciences  
Category III

Dr. Reeves’ research includes collaboration with physical therapists, orthopedic surgeons, and clinicians to investigate pathological issues from an anatomical and biomechanical perspective. Recent research involves ultrasound diagnosis of ankle injuries and surface mapping of the dorsal scapular nerve for use in pain management. Other areas of interest include K-12 science outreach programs for teachers and students interested in the biomedical sciences. Dr. Reeves is also involved with clinical skills training of area health care professionals utilizing cadavers from the Center’s Willed Body Program. The Center for Anatomical Sciences houses the institution’s BioSkills Laboratory which offers numerous clinical training activities and serves as a research facility for graduate students, faculty, and orthopedic surgeons in the Dallas-Fort Worth area.
Requirements

The requirements below are in addition to the GSBS requirements listed in the GSBS Degree Programs chapter of the UNTHSC Catalog.

A student interested in the SARS discipline must maintain an overall GPA of 3.0 or better after the first semester to join SARS.

I. REQUIRED COURSES

BMSC core and required courses
BMSC 6201 – Fundamentals of Biomedical Science I
BMSC 6202 – Fundamentals of Biomedical Science II
BMSC 6203 – Fundamentals of Biomedical Science III
BMSC 6204 – Fundamentals of Biomedical Science IV
BMSC 6200 – Experimental Design and Biostatistics
BMSC 5160 – Biomedical Ethics
BMSC 5150 – Lab Rotations [two are required]

Structural Anatomy and Rehabilitation Science Students must take at least one structural anatomy and one rehabilitation science course (denoted by an asterisk below).

A student who receives a “C” or “F” in one of the discipline-specific required courses (e.g., PHAN 5401) will be allowed to self-remediate the course and still take the oral qualifying exam in the summer of year 1 or the fall of year 2. A student who receives two or more “C’s” or “F’s” in the discipline-specific required courses must retake those courses in their entirety the following year. If they receive “A’s” and/or “B’s” upon retaking the courses, they will be allowed to take the oral qualifying exam.

II. SEMINAR COURSES, JOURNAL CLUB COURSES, AND WIPs

PHAN 6000 – Teaching Practicum
PHAN 6100 – Laboratory Teaching Practicum
PHAN 5140 – Seminar in Current Topics
PHAN 6150 – Journal Club

All SARS students are required to register for a journal club course (PHAN 6150, PHAN 5140) during every long semester beginning in the spring of year 1. Once MS students register for Thesis (BMSC 5395) or PhD students register for Doctoral Dissertation (BMSC 6395), they are no longer required to register for a journal club course; however, we encourage attendance.

Students interest in education and teaching are encouraged to take PHAN 6000 and PHAN 6100. This is not requirement for all student, but we encourage all those interested in academic environments to participate in these courses.
III. ELECTIVE (ADVANCED AND TECHNIQUE) COURSES (Must include 4-6 SCH for MS Students and 8-10 for PhD students from the following (other courses can be substituted according to the research project of the student):

Structural Anatomy
Offered every fall:
PHAN 6340 – Structural Anatomy of the Musculoskeletal System
PHAN 5630 – Structural Neuroscience
PHAN 5332 – Structural Anatomy of the Cardiopulmonary System
PHAN 5334 – Structural Anatomy of the Human Digestive and Renal System
PHAN 5400 – Histology
PHAN 1234 – Advanced Head and Neck Anatomy

Offered every spring:
PHAN 5401 – Structural Anatomy [recommended anatomy elective for all SARS student]
PHAN 5330 – Structural Anatomy of the Human Reproductive System
PHAN 1234 – Embryology

Rehabilitation Sciences
Offered every fall:
DPHT 7501 – Clinical Med I*
DPHT 7320 – Integrated Control of Movement*

Offered every spring:
PHAN 6307 – Principles of Movement and Motor Control*
PHAN 6308 – Applied Biomechanics* [recommend rehabilitation science elective for all SARS student]
DPHT 7305 – Applied Anatomy and Kinesiology*
DPHT 7324 – Development and Geriatrics*
DPHT 7323 – Applied Exercise Physiology*
DPHT 7225 – Culture, Teaching and Learning*
DPHT 7254 – Advanced Clinical Diagnostic and Imaging*
DPHT 7256 – Health Promotion*
DPHT 7502 – Clinical Med II*

Other
Students may take courses from other programs as electives with consent from the major professor and the SARS graduate advisor.
### SAMPLE DEGREE PLANS

#### 1. Master of Science

The typical degree plan leading to the M.S. degree is outlined below. The degree plan may vary depending on availability of course offerings in a given semester and each student’s background and progress toward the thesis project. This is a template and should be modified accordingly.

**MS Degree Plan for Structural Anatomy and Rehabilitation Sciences Track**

**Year 1: Fall**
- BMSC 6201  Fundamentals of Biomedical Science I  2
- BMSC 6202  Fundamentals of Biomedical Science II  2
- BMSC 6203  Fundamentals of Biomedical Science III  2
- BMSC 6204  Fundamentals of Biomedical Science IV  2
- BMSC 5150  Lab Rotations  1
- BMSC 5150  Lab Rotations  1
- BMSC 6200  Experimental Design and Biostatistics  2

**Year 1: Spring**
- PHAN 5140  Seminar in Current Topics  1
- BMSC 5160  Biomedical Ethics  1
- BMSC 5315  Principles of Scientific Communication  2
- PHAN 6150  Anatomy Journal Club  1
- BMSC 5998  Individual Research  1-4
- ELECTIVES  ELECTIVES  1-6

**Year 1: Summer**
- BMSC 5998  Individual Research  6

**Year 2: Fall**
- BMSC 5390  Special Problems  1-3
- BMSC 5998  Individual Research  1-6
- ELECTIVES  Electives  1-6

**Year 2: Spring**
- PHAN 6000  Teaching Practicum  1
- PHAN 6150  Journal Club  1
- BMSC 5998  Individual Research  1-4
- ELECTIVE  ELECTIVES  1-6

**Year 2: Summer**
- BMSC 5395  Thesis  6
II. Doctor of Philosophy (Ph.D)

The typical degree plan leading to the Ph.D. is outlined below. The degree plan may vary depending on availability of course offerings in a given semester and each student’s background and progress toward the thesis project. This is a template and should be modified accordingly.

### Year 1: Fall

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<td>BMSC 6200</td>
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**D.O./Ph.D. and P.T./Ph.D. DEGREES**

At least 60 hours of credits not included in the D.O. or DPT programs are required to obtain a Ph.D. in Structural Anatomy and Rehabilitation Sciences as a second terminal degree.
Advancement to Candidacy

I. Master of Science

Advancement to Master’s Candidacy is achieved after successful completion of a research proposal.

The research proposal is a detailed outline of the thesis project. It must include a summary of the proposed project, the hypothesis and aims to be investigated, significance and innovation of the project, research design and methodology to be used, a review of the salient literature that supports or opposes the hypothesis, and potential limitations. To take advantage of the advisory committee's expertise and advice, and to clearly define the project and the committee's expectations, it is imperative that the student meets with his/her advisory committee before preparing the research proposal. **The research proposal should be provided to the advisory committee no later than 14 days prior to the defense.** The formal presentation and defense of the research proposal will only be to the members of the student's advisory committee. The research proposal must be approved by the advisory committee and the Dean prior to registering for Thesis (BMSC 5395). It is expected that M.S. students will complete their Research Proposal in the Fall of year 2. Research Proposal Guidelines and the Research Proposal approval forms are available on the **GSBS Forms and Guidelines website.**

Research Proposal Guidelines and the Research Proposal approval forms are available on the **GSBS Forms and Guidelines website.**

Once a master’s student has successfully advanced to candidacy, he/she may use “MS Candidate” as a title on any general business correspondence such as business cards, e-mail messages, etc.
II. Doctor of Philosophy

Advancement to Doctoral Candidacy is a two-step process. The first step of this process is successful completion of the Oral Qualifying Examination, a common rite of passage in most doctoral programs regardless of the field of study. The second step of this process is the preparation and defense of a research proposal. Below are details of the Structural Anatomy and Rehabilitation Sciences Discipline for advancing to candidacy.

A. Oral Qualifying Examination

The qualifying examination ensures that the doctoral student has mastered information needed to succeed as a Ph.D. in the fields associated with Structural Anatomy and Rehabilitation Sciences (e.g., biomechanics, evolutionary biology, experimental biology, physical therapy, engineering). The qualifying examination within the Structural Anatomy and Rehabilitation Sciences discipline should be successfully completed after completing the GSBS core, the one Structural anatomy elective, and the one rehabilitation science course with a GPA of at least 3.0. The course requirement to take the exam will be slightly modified for dual degree students. The main goal of the examination is to ensure that each doctoral student has a broad knowledge base in the biomedical sciences, evolutionary biology, and principles of anatomy and rehabilitation science. Students should also be able to discuss concepts associated with biochemistry, immunology, physiology, and cell biology. Students will be expected to work with their committee to create a bibliography. The first draft of the bibliography needs to be submitted at least 6 weeks prior to the oral examination. Faculty will return the bibliography to the student within two weeks. The goal is to provide the entire committee and the student with a working body of scientific knowledge to draw from during the exam. The student is expected to become knowledgeable in their previous course work, reading of textbooks and scientific literature, and discussion with faculty members.

A committee comprised of members of the Structural and Rehabilitation Sciences graduate faculty, other UNTHSC faculty members, and the student’s university member administer the qualifying examination. The graduate advisor in consultation with the student’s major professor will appoint the exam committee. The student’s major professor may attend the qualifying examination, may ask questions, but cannot be present during the voting or cast a vote. The qualifying examination will be administered in the Summer of year 1 or the Fall of year 2. Two attempts to successfully pass the qualifying examination are allowed. Failure of the student to pass the qualifying examination results in dismissal of the student from the doctoral program. A doctoral student who does not pass may be allowed to complete the requirements for a Master of Science degree (terminal Master’s Degree). It is the responsibility of the student to obtain signatures from the examination committee, university member, graduate advisor, and department chairman upon completion of the exam. The appropriate form may be obtained from the GSBS Forms and Guidelines website.

All modification to the requirements must be discussed with the graduate advisor.

B. Research Proposal
The research proposal is an outline of the dissertation project. It must include a summary of the proposed project, the hypothesis and aims to be investigated, significance and innovation of the project, research design and methodology to be used, a review of the salient literature that supports or opposes the hypothesis, and potential limitations. To take advantage of the advisory committee's expertise and advice, and to clearly define the project and the committee's expectations, it is imperative that the student meets with his/her advisory committee before preparing the research proposal. The research proposal should be provided to the advisory committee no later than 10 days prior to the defense. However, it is strongly recommended that the student provide their research proposal to their advisory committee earlier (ideally, 4 weeks in advance). This is a professional courtesy to the advisory committee and may assist the student in strengthening their proposal prior to the defense. Research Proposal Guidelines and the Research Proposal approval forms are available on the GSBS Forms and Guidelines website.

The student will set a meeting with his/her mentor and advisory committee including the university member to present and defend the proposal. The student’s advisory committee will determine if the proposal is satisfactory.

For Ph.D. students, the proposal should be completed within a year of having passed their qualifying examination (ideally in the summer of year two). The proposal must be approved by the student’s advisory committee and submitted to the GSBS, at the latest, during the semester prior to the student’s final semester. The formal presentation of the research proposal will only be to the members of the student’s advisory committee. The research proposal must be approved by the advisory committee and the Dean prior to registering for Dissertation (BMSC 6395). Research Proposal Guidelines and the Research Proposal approval forms are available on the GSBS Forms and Guidelines website.

Upon completion of the qualifying exam and the research proposal, a Ph.D. student will be advanced to candidacy. M.S. students are not required to take the qualifying examination but are required to complete the research proposal.

Once a doctoral student has successfully advanced to candidacy, he/she may use “PhD Candidate” or “Doctoral Candidate” as a title on any general business correspondence such as business cards, e-mail messages, etc. In addition, the minimum number of credit hours required for full-time enrollment drops from 12 SCH to 9 SCH in long semesters.
Other

I. Yearly Progress Reports
   The yearly progress report is a formal meeting where the student and advisory committee meet to evaluate your progress. This meeting is intended to help student focus on their personal academic goals within their selected academic field. Please see the GSBS Forms and Guidelines website for the rubric associated with this yearly milestone. This report will allow you to reflect on your academic year and your research progress. During this meeting, faculty may advise on how best to improve. Again, this meeting is to help teach you how to create and manage your research agenda.

   Yearly progress reports are due no later than the last day of the summer semester as defined by the most current academic years calendar. However, it is strongly encouraged that students submit at least a month early.

II. Individual Development Plan
   The individual development plan (IDP) is a tool to help a student focus on how to leverage their expertise into a satisfying and productive career. Student will be required to complete an IDP throughout their graduate careers at UNTHSC. The individual development plan (IDP) will help students explore career possibilities and set goals to follow the career path that fits them best.

   Students will be prompted by the GSBS when an IDP requires submission, revision, or reevaluation.