Chapter 3. Curriculum – Foundational and Clinical Sciences

Introduction

The Foundational and Clinical Sciences matrices provide the core building blocks and contextual framework for teaching content associated with the practice expectations for physical therapy as described in Chapter 2. Practice Expectations are described as follows:

The **Foundational Sciences** matrix is organized by the scientific disciplines that contribute to the development and understanding of physical therapy. It includes sciences that can be described as basic and applied, and as biological, physical, and behavioral. The Foundational Sciences matrix is found on pages 82–110.

The **Clinical Sciences** matrix uses a systems approach consistent with the *Guide to Physical Therapist Practice* to describe the material needed to understand both diseases that require the direct intervention of a physical therapist for management and diseases that affect conditions being managed by physical therapists. The Clinical Sciences matrix is found on pages 111–121.

Within both sciences, three elements are addressed in this chapter:

- *Primary Content* – a list of the topics that are included in this area. This list is meant to be relatively exhaustive.
- Examples of *Terminal Behavioral Objectives (TBOs)* – a list of suggestions of the appropriate behaviors that could be expected of students upon completion of study of this material in the curriculum. This list is not intended to be exhaustive.
- Examples of *Instructional Objectives (IOs)* – a list of suggestions for specific instructional activities in terms of expected outcomes. This list is not intended to be exhaustive.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Biology/Anatomy, Cellular Histology, Physiology		
Four tissue types: epithelial, nervous, connective, muscle	• Describe the composition of organs directly affected by physical therapy interventions.	• Describe the role of pseudo-stratified epithelium in the respiratory tract. • Discuss how the epithelium is modified to address functions of secretion, absorption, movement, and protection.
Systems		
Circulatory (cardiovascular, lymphatic, and immune) Gross anatomy Surface anatomy Histology Embryology Physiology	• Describe the gross anatomical components and relationships of the circulatory system. • Demonstrate the ability to relate anatomical structures of the circulatory system with surface anatomy of the circulatory system. • Describe and discuss the function of the cells and cellular components of circulatory system structures. • Describe the development of the circulatory system. • Demonstrate the ability to apply the basic concepts of gross anatomy to the analysis of patient/client problems related to the circulatory system.	• Identify the lymphatic drainage pathway from the extremity to the right atrium. • Describe the surfaces and borders of the heart as found in the mediastinum. • Describe all pertinent structures of all four chambers of the heart. • Describe the borders of the heart as they relate to surface anatomy. • Diagram the fetal circulation pattern. • Explain the systemic factors (blood volume, hormones, mechanical influences, etc) that determine systolic and diastolic blood pressure (BP).
Endocrine Gross anatomy Physiology	• Describe the gross anatomical components of and relationships of the endocrine system. • Demonstrate the ability to relate anatomical structures of the endocrine system with surface anatomy of the endocrine system. • Describe and discuss the function of the cells and cellular components of endocrine system structures. • Describe the development of the endocrine system. • Demonstrate the ability to apply the basic concepts of gross anatomy to the analysis of patient/client problems related to the endocrine system.	• Identify and describe actions of hormones secreted by the anterior pituitary gland.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Gastrointestinal (GI) Gross anatomy Surface anatomy Physiology	• Describe the gross anatomical components and relationships of the gastrointestinal (GI) system. • Demonstrate the ability to relate anatomical structures of the gastrointestinal system with surface anatomy of the gastrointestinal system. • Describe and discuss the function of the cells and cellular components of gastrointestinal system structures. • Describe the development of the gastrointestinal system. • Demonstrate the ability to apply the basic concepts of gross anatomy to the analysis of patient/client problems related to the gastrointestinal system.	• Describe the mesenteric plexi. • Discuss the role of smooth muscle in peristalsis. • Describe the process of digestion.
Genitourinary (GU) Gross anatomy Surface anatomy Physiology	• Describe the gross anatomical components and relationships of the genitourinary system. • Demonstrate the ability to relate anatomical structures of the genitourinary system with surface anatomy of the genitourinary system. • Describe and discuss the function of the cells and cellular components of the structures of the genitourinary system. • Describe the development of the genitourinary system. • Demonstrate the ability to apply the basic concepts of gross anatomy to the analysis of patient/client problems related to the genitourinary system.	• Describe the regulation of body volume, electrolyte concentration, and acid/base status (pH). • Describe how aging affects the function of the bladder.
Integumentary Gross anatomy Histology Embryology Physiology	• Describe the gross anatomical components and relationships of the integumentary system. • Demonstrate the ability to relate anatomical structures of the integumentary system with surface anatomy of the integumentary system. • Describe and discuss the function of the cells and cellular components of the structures of the integumentary system.	• Explain the function of the skin in maintaining homeostasis. • Discuss the relationship of skin area to heat regulation. • Describe differences between the skin in various areas of body. • Describe the process of collagen formation and deposition.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Integumentary (continued)	• Describe the development of the integumentary system. • Demonstrate the ability to apply the basic concepts of gross anatomy to the analysis of patient/client problems related to the integumentary system.	• Identify the tissue layers involved in a full-thickness burn.
Metabolic Physiology Muscular Gross anatomy Surface anatomy Histology Embryology Physiology	• Describe the factors that regulate basal metabolic rate. • Describe the gross anatomical components and relationships of elements of the muscular system. • Demonstrate the ability to correlate gross anatomical muscular structures within surface anatomy. • Describe and discuss the function of cells and cellular components of the structures in the muscular system. • Describe the development of the muscular system. • Demonstrate the ability to apply the basic concepts of gross anatomy to the analysis of patient/client problems related to the muscular system.	• Describe pathways for the conversion of carbohydrates, fats, and proteins to energy. • Describe the role of mitochondria in muscle cells. • Discuss how muscle tissue is repaired. • Describe how the length-tension relation of muscle affects force production. • Describe the molecular basis of muscle contraction. • Discuss the relationship between the sarcomere and the development of muscle tension. • Describe the histochemistry, structure, and function of the three major subtypes of skeletal muscle. • Describe the types of muscle contractions and give functional examples for each type. • Describe the origin, insertion, innervation, and function of each skeletal muscle that crosses the hip joint. • Describe patterns of abnormal movement that are the result of weakness and/or paralysis of individual muscles.
Nervous (central nervous system [CNS], peripheral nervous system [PNS], and autonomic nervous system [ANS]) Gross anatomy Surface anatomy Histology Embryology Physiology	• Describe the gross anatomical components and relationships of the nervous system. • Demonstrate the ability to correlate gross ANS structures to surface anatomy landmarks. • Describe and discuss the function of cells and cellular components of the nervous system structures.	• Describe function of the organelles of the neuron. • Describe the relationship between structure and function of CNS cells. • Describe how neural factors contribute to changes in blood pressure. • Test the structures that are affected given a hypothetical lesion.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Nervous (continued)	• Describe the development of the nervous system. • Demonstrate the ability to apply the basic concepts of gross anatomy to the analysis of patient/client problems related to the nervous system.	• Predict what physical impairments are produced given a hypothetical lesion. • Describe the evolution of the CNS as a basis for understanding the development of congenital malformations. • Describe the patterns of peripheral nerve innervation of skin and skeletal muscles and differentiate these patterns from dermatomal and myotomal patterns. • Describe the patterns of weakness and sensory loss as a result of lesions at locations along a peripheral nerve.
Respiratory Gross anatomy Surface anatomy Histology Embryology Physiology	• Describe the gross anatomical components and relationships of the respiratory system. • Demonstrate the ability to correlate gross anatomical respiratory structures with surface anatomy. • Describe and discuss the function of cells and cellular components of the structures in the respiratory system. • Describe the development of the respiratory system. • Demonstrate the ability to apply the basic concepts of gross anatomy to the analysis of patient/client problems related to the respiratory system.	• Describe the primary and accessory muscles of respiration. • Describe important landmarks on the surfaces of both lungs. • Describe the bony framework of the thorax. • Compare and contrast the epithelial layer through the respiratory tract. • Trace an oxygen molecule from the alveolus to the capillary through the extracellular and intracellular structures of the alveolar membrane. • Differentiate between oxygen content and oxygen-carrying capacity. • Describe factors that influence the oxyhemoglobin curve. • Describe factors that regulate oxygen uptake at the cellular level.
Skeletal Gross anatomy Surface anatomy Radiographic anatomy Histology Embryology Physiology	• Describe the gross anatomical components and relationships of the skeletal system. • Demonstrate the ability to correlate gross skeletal structures within surface anatomy. • Identify on a radiograph the components and relationships of the skeletal system.	• Describe the relationship of the bones of the glenohumeral joint and identify the significant anatomical landmarks for each bone. • Describe the significant relationship of bony prominences to other structures in the area. • Describe the formation of callus and mature bone following fractures.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Skeletal (continued)	• Describe and discuss the function of cells and cellular components of the structures in the skeletal system. • Describe the development of the skeletal system. • Demonstrate the ability to apply the basic concepts of gross anatomy to the analysis of patient/client problems related to the skeletal system.	• Contrast endochondral and intramembranous bone formation. • Describe how bone responds to loading. • Describe the response of bones to immobilization. • Describe the influences of parathyroid hormone, calcitonin, and vitamin D on bone formation and resorption.
Exercise Physiology (See Appendix D)		
Physiological responses to various types of exercise (endurance, strengthening) Cardiovascular, pulmonary, renal, endocrine, metabolic systems Thermoregulatory system and the effects on the environment Physiological responses based on the influence of age, genetics, and culture on resting measurements and responses to activity Muscle cell anatomy and physiology	• Describe physiological responses during progressive endurance exercise across systems (eg, musculoskeletal, neuromuscular, integumentary, etc). • Describe and analyze physiological responses of the thermoregulatory system in different environments including heat, humidity, and cold. • Describe changes in physiological measurements that occur as a result of endurance exercise training based on age, gender, and culture. • Describe and analyze the different energy systems (ATP/CP, glycolysis, oxygen transport/ electron transfer) used in different activities (eg, one minute, anaerobic, or aerobic activities). • Describe muscle cell anatomy (striated, skeletal, cardiac), physiology, and adaptations to training. • Develop exercise prescription for muscle adaptation. • Describe the principles of specificity of training in relation to muscle fiber type and training effects and develop exercise prescriptions to optimize an individual's training.	• Describe changes in oxygen consumption, heart rate, blood pressure, blood flow to major organs, tidal volume, and breathing frequency during progressive endurance exercise. • Describe changes in insulin, glucagon, growth hormone, and cortisol during progressive endurance exercise. • Describe the benefits of exercise on the insulin-insensitive individual and the precautions with exercising the insulin-sensitive individual. • Recognize and interpret symptoms of hypoglycemia. • Discuss heat stroke, heat intolerance with activity, and mechanisms to prevent these conditions. • Describe changes in a typical cardiac rehabilitation protocol based on age. • Describe fiber type changes as a result of exercise. • Describe the cardiac muscle changes as a result of an endurance-training program, weight-training program, or a combination of both. • Describe and develop training techniques to enhance the utilization of specific energy systems. • Describe adaptations of muscle cells to overuse and underuse in relation to type of training.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Adaptations to regular exercise of various types (aerobic or endurance training, interval or anaerobic training, muscle strengthening programs) Exercise specificity Effects on cardiovascular and pulmonary systems, metabolism, blood lipid levels, skeletal, connective tissue, hormonal systems Hormonal changes with exercise and aging	• Describe neural and muscular adaptations that occur as a result of resistance exercise training based on age, gender, and culture.	• Describe changes in maximal oxygen consumption, submaximal heart rate and blood pressure, and maximal and submaximal ventilation that occur as a result of endurance exercise training. • Describe changes in capillary density, oxidative enzymes and mitochondria that occur as a result of endurance exercise training. • Discuss the effects and side effects of the use of hormones and steroids for improving muscle strength. • Differentiate the effects of aging and gender and exercise on hormones, including cortisol, estrogen, testosterone, and insulin.
Nutrition Normal dietary intake Performance enhancing supplements and side effects Basic energy systems	• Compare and contrast diets for all populations for health, fitness, and wellness. • Examine the health, wellness, and fitness of diets (including any supplements) and activity for all populations.	• Describe the normal intake of carbohydrates, proteins, fats, vitamins, water, and minerals in daily American diets. • Compare the differences in diet in athletes of different sports. • Describe effects of performance enhancing supplements and the side effects of usage of these supplements. • Discuss the scientific basis of weight loss, muscle gain, and diet and performance. • Discuss the effects of diet and socioeconomic factors on Native Americans. • Describe nutritional intake of calcium for pregnant and postmenopausal women.
Adaptations to diminished activity	• Describe the effects of bed rest and immobilization of a body part on various tissues and systems.	• Describe the rates of change of maximal oxygen consumption, muscle strength, bone mineral density, and blood volume that occur during prolonged bed rest. • Describe changes in sarcomere length and number that occur with immobilization of a muscle in a shortened versus lengthened position.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Adaptations to diminished activity (continued)		• Describe the process of bone demineralization during immobilization and how it might be prevented.
Assessment and interpretation of measurements of body composition	• Describe the measurement principles and accuracy of common methods to measure body composition (hydrostatic weighing, bioelectrical impedance, skinfold measurements, and circumferential measurements). • Describe recommended ranges for percent body fat based on age and gender.	• Describe variations in the density of lean body mass based on age, race, and ethnicity and how these variations affect estimates of percent fat.
Principles of exercise testing	• Describe advantages and disadvantages of maximal versus submaximal exercise stress tests. • Identify criteria used to determine if a diagnostic stress test is positive or negative. • Describe various methods to determine maximal force production of specified muscles.	• Conduct an exercise stress test on a healthy individual using the Bruce protocol; interpret the results. • Predict maximal oxygen consumption using results of a submaximal exercise test. • Perform an examination and evaluation of muscle torque production using an isokinetic dynamometer.
Principles of exercise prescription to improve cardiovascular fitness To improve health (decrease risk of selected diseases) To increase muscle strength and endurance	• Differentiate between an appropriate exercise prescription to improve health versus to improve cardiorespiratory fitness. • Differentiate an exercise prescription to improve muscular torque production versus an exercise prescription to improve muscular endurance. • Design an individual exercise prescription for health, fitness, or wellness, based on exercise performance.	• Generate an exercise prescription for a 75-year old female whose goal is to remain healthy and to live independently in the community. • Generate an exercise prescription for a 25-year old male who would like to improve his performance in running 5-kilometer races.
Exercise (See Appendix D)		
Prescription, implementation, and modeling Strength training	• Analyze and implement an exercise program to build strength.	• Differentiate the use of exercise forms for building strength. • Analyze and select equipment/means to build strength.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Strength training (continued)		• Analyze and prescribe exercise parameters/principles to build strength. • Demonstrate and instruct the individual in exercise techniques to build strength.
Power training	• Analyze and implement an exercise program to develop power.	• Differentiate the use of exercise forms for developing power. • Analyze and select equipment/means to develop power. • Analyze and prescribe exercise parameters/principles for developing power. • Demonstrate and instruct the individual in exercise techniques to develop power.
Aerobic/anaerobic conditioning	• Analyze and implement aerobic/anaerobic conditioning programs.	• Analyze and select methods of training for aerobic/anaerobic conditioning. • Analyze and prescribe exercise parameters/principles for aerobic/anaerobic conditioning.
Flexibility	• Analyze and implement a flexibility program.	• Differentiate the use of types of flexibility principles. • Analyze and select flexibility methods and techniques. • Analyze and prescribe flexibility parameters.
Agility, coordination, and balance	• Analyze and implement an agility, coordination, and balance program.	• Demonstrate knowledge, understanding, and application of principles for agility, coordination, and balance requiring proximal stability/distal mobility. • Analyze and prescribe methods for developing agility, coordination, and balance.
Relaxation/stress management	• Analyze and implement a program of relaxation and stress management.	• Demonstrate, analyze, and prescribe forms of relaxation training.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Biomechanics		
Kinematics Kinetics	• Describe the relationship between osteokinematics, arthrokinematics, and muscle function across the lifespan. • Apply principles of biomechanics to describe joint function. • Describe components of motion and muscle function to analyze movement specific to sport, recreation, and activity. • Describe methods to alter force production in various activities and/or environments. • Apply biomechanical principles to promote or deter movement and movement dysfunction. • Describe the biomechanics of static and dynamic posture. • Determine which muscles must be active during various functional activities (eg, the muscles used during the swing phase of gait). • Calculate the maximal ground reaction force that occurs during ambulation. • Determine where the center of gravity occurs with various postures and when stability is not possible. • Calculate the moments created by contraction of muscles and the compressive load those muscles place on joint surfaces. • Determine the loads that are applied to tissues of the musculoskeletal system during functional activities. • Describe biomechanical principles needed to mobilize joints correctly.	• Determine which muscles must be active during various functional activities. • Calculate the maximal ground reaction force during ambulation. • Describe the changes in the moment arm of a muscle as a limb segment moves through a range of motion (ROM). • Describe the kinematics of a normal shoulder movement. • Generate an exercise program that is designed to load bone for the prevention of osteoporosis.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Kinesiology		
Regional functional anatomy Joint function and mechanics Kinetics Applications Developmental biomechanics Pathomechanics Principles of safe and efficient movement Emergency (EMG) response	• Describe factors that influence velocity, force, and components of skeletal muscle contraction. • Describe mechanisms by which muscles remodel to match function. • Describe mechanisms of muscle adaptation that occur as a result of exercise training or lack of training. • Describe components of motion and factors influencing motion to analyze movement specific to sport, recreation, and activity. • Describe normal variations of joints and muscle function when observing movement patterns. • Apply a thorough understanding of the translational and rotational movements of a joint. • Evaluate the effects of altered joint range of motion (ROM) on a given functional activity. • Demonstrate correct body mechanics. • Use knowledge of joint and tissue mechanics in the design, fabrication (where appropriate), and application of orthoses and prostheses. • Use knowledge of joint mechanics and physical principles in the prescription and application of assistive devices.	• Describe how the length-tension relation of muscle affects force production. • Describe patterns of abnormal movement that are the result of weakness and/or paralysis of individual muscles. • Differentiate primary and secondary movers. • Describe motion in the sagittal plane that occurs at the knee when safely walking at various speeds. • Compare the basic biomechanics of normal gait for the child, adult, and elderly individual. • Describe the difference in biomechanics that occur with walking as compared with a running gait. • Compare forces (in terms of percentage body weight) at the hip during running, standing on one leg, climbing stairs, walking, and standing on both legs. • Determine the effect of various abnormalities on gait biomechanics. • Explain consequences of a slumped posture on biomechanics of the shoulder. • Describe the orthotic device a patient/client with a pronated foot, hindfoot valgus, and tibial torsion would need.
Analysis of functional activities Description of movement Factors affecting motion Observation Technology-assisted Types available Information provided Interpretation of data	• Identify functional and dysfunctional movement patterns. • Differentiate between age-related and pathologically caused alterations in movement. • Discuss different forms of motion analysis. • Interpret kinetic and kinematic data from motion analysis devices.	• Describe the physical examination of the knee. • Given a body weight, calculate the torque at the knee during a descending 8-inch step. • Compare the characteristics of gait that can be monitored through observation with those that can be measured with motion analysis devices.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Neuroscience		
Neuroembryology Normal development of the nervous system Development of the nervous system in the presence of teratogens and trauma	• Summarize the principles and the time sequence for neurodevelopment. • Differentiate the sequelae of impaired development during various critical periods of sensorimotor systems. • Integrate knowledge of maturation of the nervous system with knowledge about automatic and volitional movements. • Summarize genetic and epigenetic influences on CNS development.	• Describe the stages of neural development with attention paid to changes occurring during each trimester. • Describe the usual consequences of Fetal Alcohol Syndrome to the CNS during the gestational period.
Neurophysiology (PNS, CNS, ANS) Membrane properties Processing of information at neuronal level including concepts of long-term potentiation Neurotransmission (electrical and chemical neurotransmitters)	• Describe the implications of neurotransmission to the development of normal human movement. • Apply knowledge of neurotransmission to recovery from CNS/PNS damage. • Apply knowledge of neurotransmission to learning. • Describe the effect of serum blood levels (or neurochemistry) on membrane excitability.	• Discuss research evidence for the effect of factors that influence neuroplasticity. • Describe neurotransmission at the cellular level. • Integrate concepts of force generation, human movement, and neurotransmission. • Describe principles of behavioral training that drive neuroplastic changes in the nervous system.
Plasticity During development Status post injury or disease During learning Channels and gates	• Describe mechanisms of neural plasticity and their impact on development, recovery of function, and learning. • Describe factors that influence neural plasticity (eg, motivation, repetition, age, culture, socioeconomic status [SES], nutrition, and comorbidities). • Discuss the role that the different sodium channels play in the membrane potential and the generation of the action potential. • Describe how neural transmission of single cells becomes translated into function via mechanisms such as neural cell assemblies and neural population vectors. • Describe the process of neural transmission from peripheral receptors to the CNS.	

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Neuroanatomy (CNS, ANS) Classification of neurons Ascending pathways, descending pathways, and interconnections Composition and functions of regions or systems (eg, brain, brainstem, cranial nerves, spinal cord) Blood supply of brain, brainstem, and spinal cord Ventricular system/cerebrospinal fluid Meninges and meningeal spaces Plasticity	• Describe the gross anatomy of the brain, brainstem, and the spinal cord. • Correlate the role of major ascending and descending systems to clinical signs and symptoms. • Describe the role of the extrapyramidal system (eg, cerebellum, basal ganglia) with regard to movement and motivation. • Explain the function of the meningeal layers. • Compare and contrast cerebral and systemic circulation. • Correlate results from imaging techniques to the structure and function of the nervous system. • Describe the effects of aging on the nervous system.	• Describe the tracts and CNS structures used to process proprioceptive information. • Discuss the importance of the blood/brain barrier. • Compare and contrast functions of the medulla and the functions of the pons. • Describe the clinical manifestations of tumor location, traumatic injury, or vascular compromise. • Describe the role of the cerebellum and basal ganglia in controlling posture and movement. • Compare and contrast frequency coding and recruitment of motor units for force production. • Describe the structures and pathways associated with the special visual and vestibular senses. • Compare and contrast the effects of different efferent pathways on motor control.
Neurological function Motor control Theories and models of motor control Clinical syndromes related to motor and postural control Feedback and feed-forward control mechanisms Motor learning Theories and models of motor learning Practice effects Cognition Memory, language, arousal and attention, reasoning, problem-solving, categorization, and memory Sensation and perception Sensory system: neuroanatomy and physiology of sensory systems (vision, auditory, olfaction, vestibular)	• Describe processes involved with higher cognitive function. • Describe several of the neuroscientific principles underlying motor control and motor learning. • Explain the neural recruitment of motor neurons leading to force production. • Explain the sensory input effect on motor neuron output. • Describe clinical applications of motor control and learning theories/models.	• Outline the neural pathways and processes that contribute to balance, postural control, and motor learning. • Describe the difference between short-term and long-term memory. • Describe the effects of epigenetic factors (eg, aging, cultural bias) on sensation and perception. • Outline the sequence of motor development for mobility and postural control. • Define the differences in definition and the process involved in motor learning and motor control. • Describe the basic assumptions underlying Dynamical Pattern Theory. • Describe the functional consequences of deficits in motor planning. • Compare and contrast motor learning that occurs at the spinal cord level with the brain level.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Neurological function (continued) Neuroimmunology Antigens acting on neural tissue Affective control Limbic system		• Describe the effect of basal ganglia damage, as seen with Parkinson disease, on motor control. • Compare and contrast the processes of motor learning with the processes of cognitive learning.
Pharmacology		
Pharmacokinetic principles Dose-response relationships Administration routes Enhancement of transdermal drug absorption Absorption and distribution Biotransformation and excretion Factors affecting pharmacokinetics Potential drug interactions Pharmacodynamics	• Describe the primary pharmacokinetic factors involved in drug therapy (drug administration, absorption, distribution, interaction, and elimination). • Draw a dose response curve for drugs, and indicate the threshold dose and ceiling dose. • Describe the primary methods of enteral drug administration (oral, buccal/sublingual, rectal) and the primary methods of parenteral drug administration (injection, inhalation, topical, transdermal, others). • Identify the factors that may enhance transdermal drug absorption. • Explain how ultrasound (US) and/or electrical stimulation (ES) can be used to enhance transdermal drug administration. • Differentiate between transdermal application for local versus systemic effects. • Describe how specific physical therapist interventions such as thermal agents, massage, and exercise can affect drug absorption and distribution. • List the primary organs and tissues in the body that are responsible for drug metabolism. • List the factors that can alter normal pharmaco-kinetics (age, disease, drugs, genetics, nutrition, chemicals, body composition, and gender). • Explain how altered pharmacokinetics may lead to a decrease or an increase in drug effects, and how these effects may be recognized in patients/clients receiving physical therapy.	• Define the terms bioavailability, volume of distribution, clearance, and half-life. • Compare intrathecal administration of baclofen (Lioresal) with oral administration in terms of reduced dosage, improved antispasticity effects, and decreased incidence of side effects. • Describe five ways a physical therapist could increase the transdermal absorption of Dexamethasone.® • Compare the transdermal absorption of Dexamethasone® when enhanced by US or ES with passive absorption in specific clinical disorders (tendinitis, bursitis, and so forth). • Explain how an anti-inflammatory steroid will ultimately reach the supraspinatus tendon when this drug is administered orally and the pathway that would result if this drug was administered transdermally over the tendon. • Indicate how the absorption and distribution of insulin can be altered if exercise, thermal agents, or massage are applied to the injection site. • Summarize how acetaminophen is metabolized in the liver and how the kidneys excrete the byproducts (metabolites). • Explain how age-related declines in liver and kidney function prolong half-life of benzodiazepines (eg, Valium) in the elderly. • Explain why simultaneous use of two sedatives such as Valium and alcohol can be life threatening.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Pharmacodynamics (continued)	• Recognize and appraise conditions reflecting critical (life-threatening) drug interactions in patients/clients receiving physical therapy.	
Pathology		
Differential diagnosis related to pathology	• Define the signs and symptoms that distinguish/differentiate the common nonmusculoskeletal/nonneuromuscular and musculoskeletal and neuromuscular diagnoses in patients/clients seen by physical therapists. • Define or describe the presenting signs and symptoms and the natural course of the primary musculoskeletal, neurologic, and system disorders/diseases managed by the physical therapist. • Explain the laboratory and imaging techniques (eg, blood tests, chest films, magnetic resonance imaging [MRI]) used to differentiate these musculoskeletal, neuromuscular, cardiovascular, and cardiopulmonary diagnoses. • Recognize "red flags" in laboratory data, such as decreased hemoglobin, increased sedimentation rate, and blood in urine or stool as data indicating the need for referral. • Describe the "red flags" that require medical consultation or emergency attention.	• Compare the advantages and disadvantages of MRI and the computerized axial tomography (CAT) scan for diagnosing bone tumors or a lumbar disc problem. • Describe the signs and symptoms of a patient/client with brittle diabetes. • Describe how nerve conduction studies can distinguish between neurapraxia, segmental demyelination, and axonal degeneration. • Define positive MRI findings that support the diagnosis of multiple sclerosis. • Interpret a complete blood count (CBC).
Epidemiology	• Discuss epidemiological factors (eg, incidence, prognosis, prevalence, and genetic and other risk factors) for common conditions that occur in patients/clients treated by physical therapists.	• Define the incidence and prevalence of lung disease among smokers versus nonsmokers. • Contrast the incidence and prevalence of sickle cell anemia in different populations.
Basic principles of cellular injury	• Describe the cellular responses to injury.	• Discuss the arachidonic acid pathway following cellular injury and how various medications/physical therapy interventions may affect it.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Inflammation	• Describe the cardinal signs/symptoms of inflammation. • Explain the physiological bases for common indicators of inflammation. • Describe the relationship between physiological principles of inflammation and treatment used to minimize inflammation.	• Describe the inflammatory response occurring during a period of exacerbation in a patient/client with rheumatoid arthritis. • Describe a physical therapy intervention technique used to minimize an inflammatory response.
Tissue repair, remodeling, and regeneration	• Differentiate between tissue repair and regeneration. • Discuss the factors (including physical therapist treatment) that accelerate or interfere with tissue repair, remodeling, and regeneration. • Explain the differences in tissue repair as a consequence of race (physiological and genetic). • Compare and contrast the effects of comorbidities and drug interactions on tissue healing (eg, congenital heart defects, diabetes, cerebral vascular accident [CVA]). • Discuss the impact of mobility on the rate of healing in bone and other tissues.	• Discuss the differences in scar formation in Caucasians and individuals of color. • Outline the effects of diabetes mellitus on wound healing. • Discuss the phases of repair and remodeling on collagen deposition. Outline the time frame involved for healing.
Physiologic responses to physical agents used to affect: Pain Inflammation Thermoregulation Edema Tissue healing Blood flow	• Compare normal and abnormal physiological responses to exercise and physical agents as they affect: Pain Inflammation Thermoregulation Edema Tissue healing Circulation	• Describe how the physiological effect of heat, cold, and electrical stimulation may modify or influence local, neurological, and emotional aspects of the pain experience.
Genetic disease Nutritional factors Neoplastic factors Infections	• Describe the pathology of selected genetic, nutritional, neoplastic, and infectious disease. • Describe the concepts of genetic characteristics or traits and their relationship to genetic risk and disease predisposition.	• Discuss the effects of sickle cell anemia on exercise.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Infections (continued)	• Describe pathology clinical signs and symptoms. • Relate clinical signs and symptoms to the selected genetic, nutritional, neoplastic, and infectious pathologies. • Describe the pathological process (kinetic and nutritional) of neoplasms and infectious disease on function. • Describe the effects of physical therapist treatment on selected infectious diseases (transmission, protection, and prevention).	
Specific systems pathology Circulatory (cardiovascular, lymphatic, and immune) Endocrine Gastrointestinal Genitourinary Integumentary Metabolic Muscular Nervous Respiratory Skeletal	• Describe the pathology of common disorders found in the systems listed. • Relate clinical signs and symptoms to the various pathologies of system disorders. • Analyze the impact of the pathological process on common system disorders in terms of function. • Analyze the effects of physical therapy treatment on the pathological process of common system disorders.	• Outline the signs and symptoms of myasthenia gravis. • Discuss the benefits of exercise for patients/ clients with diabetes mellitus. • Describe the changes in bone mineralization that occur in osteoporosis and explain how physical therapy can affect these changes. • Outline the abnormal response to exercise that may occur in a patient/client with reflex sympathetic dystrophy.
Behavioral Sciences (sociology, psychology, anthropology, philosophy, epidemiology, human development throughout the life span)		
Communication		
Verbal communication Active/effective listening Empathetic responding Interview skills Language skills Communication in language other than English or impaired communication ability	• Recognize the boundary between professional and unprofessional interactions with patients/clients, and family members. • Differentiate between empathy and sympathy. • Construct empathetic statements in response to patients/clients, family members, or colleagues. • Conduct interviews using both open-ended and closed-ended questions. • Coordinate patient/client and family interviews.	• Describe the consequences of displaying anger in front of patients/clients. • Describe potential benefits of achieving patient/client outcomes from a supportive relationship between the patient/client and physical therapist. • Determine when to use open-ended and closed-ended questions in an interview. • Demonstrate the ability to ask simple questions and give simple commands in another language.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Verbal communication (continued)	• Respond to words and phrases in languages other than English to communicate with patients/clients, family members, and colleagues. • Use oral and written communication using proper grammar and syntax.	• Describe the impact that biased questions have on an interview. • Describe multiple meanings an English word has for people from different cultures. • Identify the negative impact that improper use of language may have on others.
Nonverbal communication	• Use body language congruent with intended message for communication. • Recognize, interpret, and respond to the body language of others, including eye and head movements, limb position, posture, and gait. • Recognize the positive and negative effects one's touch may have on a patient's/client's emotions and behaviors.	• Identify effective body language characteristics. • Describe the message received when the verbal message and body language are incongruent. • Demonstrate different forms of touch used in clinical practice.
Professional communication Principles of oral and written communication Use of media	• Construct complete, analytically sound, timely, and legible documentation (eg, notes, educational progress, letters, and exercise programs). • Produce documents that are organized in a logical format. • Create documents using nonjudgmental, people-first language. • Use proper syntax and grammatical rules, and acceptable terminology and abbreviations in documentation.	• Describe the principles of successful documentation of the delivery of health care services.
Relationships with others Therapeutic presence Motivational strategies (eg, behavior modification, etc) Conflict resolution Assertiveness Empowerment	• Recognize and observe therapeutic boundaries between self, patients/clients, and family members. • Recognize and value the responsibility to be committed to patients/clients and family members. • Respect individual differences in motivation.	• Describe the parameters of therapeutic boundaries. • Compare and contrast a professional relationship with a patient/client to a personal relationship with a friend. • Identify the effective use of therapeutic presence. • Identify motivating factors used to assist patients/clients in overcoming health challenges.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Relationships with others (continued)	• Formulate behavior modification strategies and therapeutic contracts to encourage and reward participation of patients/clients and family members. • Interpret interactions and situations between colleagues, patients/clients, and family members when tension exists and act to prevent escalation to conflict. • Value the process of conflict resolution in professional settings. • Apply methods of conflict resolution, including focus on specific behaviors, recognition that each position offers a contribution to the solution, and need for impartiality of a third party. • Value assertive behavior in therapists, patients/clients, family members, and colleagues. • Differentiate between passive, assertive, and aggressive behaviors. • Demonstrate assertiveness skills in order to have needs made explicit, to manage criticism, and to advocate for patient/client needs. • Involve the patient/client and family members in joint decision making regarding all aspects of the patient's/client's treatment program. • Inform and support the patient/client and family members in assuming responsibility for all aspects of the patient's/client's health care.	• Identify the characteristics of behavior modification strategies used in health services. • Trace the events that lead from a situation of tension to conflict. • Describe behaviors that contribute to the creation of conflict. • Identify the strategies used in conflict resolution. • Describe the characteristics of assertive behavior. • Hypothesize about the outcome of aggressive interaction in a defined situation. • Contrast criticism and positive feedback. • Describe an environment that supports patient/client empowerment. • Identify mechanisms health care providers may use to facilitate collaborative decision making with patients/clients for their care.
Social and Psychologic Factors		
Awareness of self and others Cultural competence	• Exhibit self-awareness of own abilities and reactions to people, and recognize areas of needed growth and seek appropriate assistance. • Value individual differences in patients/clients, family members, and colleagues based on race/ethnicity, religion, gender, age, sexual orientation, and disability.	• Describe the principles of evaluating self-awareness. • Identify internal feedback mechanisms available for monitoring interpersonal interactions. • Identify negative stereotypes that exist in society toward people with diverse backgrounds.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Awareness of self and others (continued) Cultural competence (continued)	• Understand the existence and impact of power relationships among majority and minority groups. • Interact with patients/clients, family members, and colleagues with sensitivity and tolerance to differences such as race/ethnicity, religion, gender, age, sexual orientation, and disability. • Recognize judgments and stereotypes about people from different cultural and ethnic backgrounds and continually seek to facilitate growth, understanding, and skill in working with people from diverse backgrounds.	• Identify personal stereotypes held toward people with diverse backgrounds. • Identify methods for eliminating stereotypes when interacting with people with diverse backgrounds. • Discuss the Plan to Improve the Status of Women in Physical Therapy and the societal and professional challenges women face. • Report the findings of a discussion with women professionals regarding career barriers and their impact. • Discuss the positive and negative effects of ageism.
Group dynamics and teamwork	• Identify factors that influence group decision making. • Accept the responsibility for providing task and process roles that would enhance a group's decision making. • Exhibit respect for other professionals and effectively engage in interprofessional collaboration.	• Identify the impact that factors such as gender, professional status, cultural background, and physical environment have on group decision making. • State characteristics of and strategies to prevent "groupthink." • Contrast the effectiveness between decision making for health care services by individual providers and by a team of providers.
Health behavior-change model and theories Wellness theories Health promotion	• Identify factors that affect health promotion, fitness, and wellness and discuss the role of behavior-change theories in their promotion. • Promote health, exercise, fitness, and wellness to all populations, including those with a disease or condition that may lead to impairments, functional limitations, or disabilities. • Promote exercise, health, fitness, and wellness programs with consideration to special populations, including women (ie, pregnant or diagnosed with osteoporosis), children and adolescents, the elderly, recreational and elite athletes, individuals with obesity, and individuals of different races or ethnicities.	• Describe four modifiable risk factors associated with cardiovascular disease. • Identify exercise risk factors specific to an obese male. • Develop strategies for addressing modifiable risk factors.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Psychology of exercise Motivational strategies Compliance Adherence	• Implement psychology of exercise techniques to enhance the training and/or performance of the individual.	• Understand the basic concepts of sports psychology (eg, use of visualization, mental imagery, and rehearsal). • Use various reinforcement and motivational strategies in an exercise program.
Psychological/emotional responses to exercise of sport Over-training Injury	• Demonstrate the ability to use a variety of strategies (eg, psychological, educational, and motivational) that would support and assist the injured individual.	• Identify abnormal behaviors and responses to training and modify training program. (eg, over-training, injury). • Identify and address the factors influencing adherence, motivation, and exercise behaviors.
Psychological/emotional responses to illnesses and disability Anxiety Malingering Substance abuse Suicide Stress Grief and loss Coping Depression	• Demonstrate compassion with and sensitivity to patients/clients, and family members affected by physical, cognitive, or emotional impairments/disabilities. • Recognize common emotional and cultural responses to illness and disability, and display appropriate modifications of evaluation and treatment strategies. • Identify common antecedents to fear and anxiety associated with loss of physical function. • Demonstrate the ability to use a variety of strategies that would support and assist the patient/client to embrace wellness behaviors. • Identify psychological and social factors associated with genetic diseases, risk, and predisposition. • Recognize the common physical and psycho-emotional manifestations of alcohol and drug abuse and identify how physical therapist interventions should be adjusted. • Recognize when referral to other health providers is appropriate. • Identify psychological, social, and environmental factors that contribute to stress and impact on wellness.	• Identify typical responses to physical, cognitive, and emotional disabilities. • Give examples of different cultural responses to similar diseases or disabilities. • Create strategies for explaining expected responses to disease or disability. • Describe the symptoms of fear and anxiety. • Contrast acceptable anxiety with that which is considered unhealthy. • Identify some of the causes of substance abuse. • Review a family case study of Tay-Sachs disease and discuss difficult moral and social questions. • Contrast psychological strategies with behavioral strategies used to help people avoid substance abuse. • Identify factors that precipitate threats of suicide. • Describe strategies for addressing an imminent threat of suicide. • Identify the impact unwanted stress has on health and behavior. • Distinguish between the impact of normal stress and abnormal stress. • Identify the impact of the grieving process on normal behavior.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Psychological/emotional responses to illnesses and disability (continued)	• Design stress management programs that are responsive to the patient's/client's health beliefs and lifestyle. • Describe the grieving process that accompanies loss of body function, and assist patients/clients and families in coping with this process. • Identify the role for physical therapists in treating patients for whom death is imminent. • Describe the personal, social, environmental, and biochemical factors associated with depression. • Recognize depression in one's self and one's patients/clients, and be able to support specific cognitive, social, and physical intervention. • Respond to patient/client references to depression, and refer to appropriate health care professionals. • Describe psychological and emotional adjustment to disability and appropriate referral mechanisms.	• Describe effective strategies of support for people experiencing grief. • Identify levels of depression and their impact on behavior. • Describe strategies for interacting with individuals identified as being depressed.
Emotional and physical abuse Domestic violence Elder abuse Child abuse Torture Self-abuse (mutilation) Problem awareness (incidence, prevalence, definition, population at risk) Prevention (screening techniques, when and how to intervene)	• Recognize and report behavioral and physical signs of abuse, including patterns of bruising, emotional withdrawal, and body language. • Respond to a patient's/client's report of abuse or behavioral/physical signs of abuse by referring to appropriate professionals.	• Identify the causes of physical and emotional abuse. • Describe strategies for responding to individuals reporting abuse. • Describe strategies for interacting with individuals who appear to be abused. • Report on the incidence and prevalence of domestic violence and populations at risk.
Sexuality	• Respect patient's/client's identification of his or her own sexuality. • Recognize one's biases and judgments with respect to sexual identity and seek knowledge to enhance one's own comfort level. • Recognize the impact of one's behaviors in preventing or creating an environment of sexual harassment or abuse.	• Identify prevailing views of sexuality. • Identify some of the bias toward individuals with different sexual orientations. • Identify behaviors that constitute sexual harassment. • Identify sexual problems associated with specific diagnoses and make plans of care for intervention, referral, and/or consultation.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Religion and faith	• Seek information on and respect health care practices associated with different religions. • Incorporate the patient's/client's and family's religious beliefs and practices into the patient's/client's plan of care where feasible.	• Differentiate between personal religious belief and the use of another person's belief in the healing process.
Holistic health Psychoneuroimmunology	• Discuss the scientific principles that support the practice of holistic health (mind-body relationship), and apply these principles to the care of patients/clients and family members.	• Describe effective methods of interacting with individuals who request nontraditional health care services.
Ethics and Values		
Values education Personal bias and beliefs Values realization Character education Moral education Citizen education	• Accept and respect values expressed by patients/clients, family members, and colleagues. • Incorporate the values of patients/clients and family members into plans of care. • Recognize one's prejudices, and seek information and experience to broaden one's ability to embrace and enjoy differences.	• Describe how values are developed. • Contrast different value systems of colleagues, and discuss impact on work behaviors. • Identify the basis of one's personal prejudices. • Describe the impact of prejudice on decision making.
Ethical character Ethical obligations Ethical decisions Ethical development Ethics in the workplace	• Describe the steps involved in analyzing an ethical dilemma, and defend the action one takes as an ethical agent. • Internalize and act according to the APTA *Code of Ethics and Guide for Professional Conduct*. • Define concepts of duties, rights, obligations, consequences, virtue, and context.	• Describe ethical decision making. • Compare decisions based on ethical tenets with those based on other considerations (eg, law). • Compare and contrast the ethical development of men and women as they are typically described.
Patient/client rights	• Understand the importance of providing the patient/client and family members with full information regarding all physical therapy examination and interventions. • Respect the patient's/client's choices regarding the decision to accept treatment.	• Describe the premise of establishing and maintaining an ongoing collaborative process of decision-making with patients/clients, families, or caregivers prior to initiating care and throughout the provision of services.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Patient/client rights (continued)	• Protect the confidentiality of all matters pertaining to the patient/client and family members according to the APTA *Code of Ethics and Guide for Professional Conduct,* and according to jurisdictional and federal laws.	• Contrast potential health care decisions for people for whom collaboration regarding decision-making prior to initiating care and throughout the provision of services occurs with those for whom it does not occur. • Describe the legal requirements for confidentiality. • Describe protocols for managing confidential information. • Establish and maintain an ongoing collaborative process of decision-making with patients/clients, families, or caregivers prior to initiating care and throughout the provision of services.
Advocacy	• Assume the responsibility to negotiate and advocate for appropriate health care services for patients/clients and families.	• Identify effective advocacy organizations. • Identify successful advocacy outcomes. • Identify personal strategies for serving as an advocate.
Management Sciences		
Management theory Organizational behavior	• Identify the management theory (eg, bureaucratic, behavioral, systems approach) that predominates at a place of employment. • Determine the organizational structure at a particular place of employment. • Identify one's own position on Maslow's Hierarchy. • Recognize others' positions on Maslow's hierarchy. • Explain the rationale for specific direction and supervision in physical therapy.	• Describe at least three different approaches prevalent in management theory literature. • Define span of control, delegation, and division of labor. • Explain the difference between product and services industries. • Define the five levels of Maslow's Hierarchy. • Define principles of delegation and supervision in service industries.
Negotiation theory Conflict management	• Participate in a successful negotiation. • Determine the potential for conflict in a work setting and identify the basic causes of the conflict.	• Identify the principles of ethical and effective negotiation. • Identify several reasons why conflict may occur in work settings.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Negotiation theory (continued) Conflict management (continued)	• Identify personal style of responding to conflict and how this response affects the situation.	
Time management	• Manage multiple tasks simultaneously in a workday. • Strive for work/life balance to assure achievement of personal and professional activities.	• Identify at least three techniques to improve efficient use of time. • Identify at least three common ways of working that manages time efficiently.
Finance		
Basics of accounting Fiscal data Basic principles of finance	• Develop a simple budget reflecting anticipated costs, revenues, and profit for a particular activity. • Use the principles of present value of money and return on investment to make decisions about financial allocation among competing uses for money. • Identify at least three sources of indirect and direct costs in providing a particular service. • Calculate costs of physical therapy services. • Analyze and interpret financial terms, conditions, and implications of insurance contracts.	• Define costs, revenue, and profit as these terms are used in accounting. • Distinguish between cash and accrual methods of accounting. • Define return on investment. • Define indirect and direct costs.
Sociology		
Professional roles Professional recognition Organization of professions Professional organizations	• Compare and contrast professions with other types of occupations. • Identify one's values and behaviors related to professional standards and socialization.	• Identify the reasons why certain occupations are not considered to be professions. • Distinguish among the various uses of the word profession, professional, and professionalization. • Discuss four characteristics common to all professions.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Teaching and Learning		
Learning theory Teaching methods	• Discuss different philosophical orientations that guide the design of different learning experiences. • Describe different ways of knowing or understanding. • Discuss the role of learning styles in a successful learning experience. • Determine readiness for abstract conceptualization. • Describe the discovery process in learning. • Identify practice variables, which optimize motor learning. • Design learning experiences that emphasize situational active learning by participants. • Evaluate what has been learned. • Discuss factors that have an impact on the success of learning, including socioeconomic status, language differences, age, disease processes, and emotions. • Compare and contrast adult learning with that of a child. • Match learning preferences with appropriate presentation methods. • Identify the domains of learning and suggest strategies for successful learning in each domain. • Describe the stages of health behavior change and strategies to facilitate learning in each stage.	• Discuss the need to establish a therapeutic relationship and negotiate common ground prior to teaching patients/clients and family members. • Describe the types of teaching methods best suited to clinical practice. • Describe the process of determining outcome effectiveness for a particular learning activity. • Demonstrate the use of various audiovisual aids in teaching presentations. • Demonstrate how to facilitate a discussion group. • Distinguish between effective and ineffective clinical instructor teaching strategies. • Describe the relationship between teaching style and learning style. • Design a 30-minute learning experience for teaching health care workers effective body mechanics. • Design a community health education program that is responsive to people in various stages of health behavior change.
Law		
Legislative process	• Identify the appropriate legislative body to make changes in various health care and physical therapy-related laws and regulations. • Identify appropriate methods of lobbying for change in legislation.	• Define the legal differences among federal, state, and local jurisdictions. • Define the differences among the legislative, executive, and judicial branches of government as they apply to health care.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Liability issues Contract law Due process Fraud and abuse Licensure Human resource (eg, OSHA, sexual harassment, etc)	• Identify the components of a legal action. • Identify behaviors that place the physical therapist or employer at risk for a lawsuit/legal action. • Identify behaviors that place the physical therapist or employer at risk for fraud in the Medicare program. • Discuss implications of negligence (eg, failure to perform duty, proximate cause and damage). • Differentiate between waiver of liability and establishing and maintaining an ongoing collaborative process of decision-making with patients/clients, families, or caregivers prior to initiating care and throughout the provision of services. • Determine factors to consider when purchasing professional liability insurance.	• Define the elements that constitute a lawsuit/legal action. • Describe the process of a claim of malpractice and the defense against the claim. • Compare general versus professional liability coverage. • Describe the differences between fraud and abuse. • Discuss three important components of a compliance program. • Discuss behaviors that place the physical therapist at risk for assault and battery.
Legal structure of organizations	• Compare different legal structures of health care systems. • Discuss levels of contracting in health service delivery options. • Consider employment law and the Americans with Disabilities Act (ADA) when setting personnel policies. • Incorporate state practice act and rules and regulations in the business plan. • Describe legal structures of health care systems. • Recognize the implications of corporate structures. • Understand the various components essential for contracting. • Incorporate legal requirements for developing a physical therapy business. • Incorporate federal, state, and agency requirements in business operations.	• Analyze the different legal structures for viable physical therapy practice options (eg, S-corporation, C-corporation, limited liability corporation, for-profit, and nonprofit). • Discuss the difference in fiduciary responsibility borne by a professional owner of a practice and an owner not restricted by professional licensure. • Negotiate a contract with a health club facility to provide exercise expertise (prescription and implementation) to facility members. • Develop a policy and procedure manual for a contracted service within a corporation.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Clinical Reasoning		
Clinical Reasoning Decision analysis theory Heuristics Clinical decision-making models Patterns of clinical reasoning	• Identify common biases used in arriving at decisions in situations of uncertainty. • Use simple heuristics in improving decision-making under uncertainty. • Identify typical clinical decisions required of physical therapists. • Define the role of risk in clinical decisions.	• Define the terms probability, bias, and heuristics as they apply to decision making under uncertainty. • Discuss the effect of framing on clinical decision making.
Models of Clinical Reasoning Patient care management model Hypothesis-oriented algorithm for clinicians (HOAC II) (Rothstein JM, Echternach JL, Riddle DL. Hypothesis-oriented algorithm for clinicians II: a guide for patient management. *Phys Ther*. 2003;83:455-470.)	• Identify the elements of the patient/client care management model. • Identify the steps of the HOAC II.	• Describe the process of evaluation of clinical data to arrive at patient/client decisions. • Identify clinical algorithms that can facilitate selection of physical agents for patient/client management.
Theory Theoretical models Theoretical rationale for interventions	• Discuss the use of theory and conceptual frameworks to guide practice and interpret outcomes.	• Outline the theory or conceptual framework used in supporting a particular clinical decision.
Evidence-Based Practice		
Formulate clinical questions	• Identify clinically important questions. • Identify the elements of clinical questions for answering questions related to diagnosis, prognosis, and intervention.	• Formulate clinical questions related to patients seen during clinical education experiences. • Prepare a reference list on the efficacy of interferon therapy with multiple sclerosis (MS).
Identify appropriate information sources	• Use current technology resources to gather information about health personnel supply and demand, models of health care delivery, and efficacy of practice.	• Describe differences between health-related databases such as MEDLINE and Cumulative Index to Nursing and Allied Health Literature (CINAHL).

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Critically analyze evidence Research design Experimental Nonexperimental Quantitative Qualitative Measurement science Definitions Requirements Data types Reliability and validity of quantitative data Trustworthiness of qualitative data Sensitivity and specificity Applied statistics Sampling population Sampling techniques Probability sampling Nonprobability sampling Reference populations False positive False negative Dependent variables Independent variables Common statistical tests Parametric statistics Nonparametric statistics	• Compare the philosophical and resulting methodological differences between positivistic and naturalistic research. • Outline the advantages and disadvantages of different types of experimental research designs. • Identify major differences in sampling techniques, instrumentation, procedures, and data analyses techniques common to experimental and nonexperimental research designs. • Define the basic terms of measurement theory science. • Outline the basic requirements of measurement: data type, reliability validity, sensitivity, specificity, reference norms, calibration, and standardization. • Define the following types of data: nominal, ordinal, equal interval, and ratio. • Describe the applications of the different types of reliability: internal-consistency, intrarater reliability, interrater reliability, and test-retest reliability. • Describe the applications of the different types of validity: face validity, content validity, criterion-related validity, concurrent validity, predictive-validity, and construct validity. • Describe the use of credibility, transferability, dependability, and confirmability in establishing trustworthiness of naturalistic research designs. • Outline the purpose of population sampling in terms of bias, statistical analysis, and generalizing findings. • Discuss the different types of systematic sampling and the strengths/weaknesses of each: random sampling, systematic sampling, and stratified sampling.	• Identify the research approach and design needed to answer a particular type of clinical question. • Compare the characteristics of a study population to the clinical population in question. • Categorize the following types of data: gender, height, manual muscle test, ethnicity, and blood pressure. • Outline methods for determining the trustworthiness of interview data. • Determine reliability using the intraclass correlation coefficient. • Determine if the Barthel Index measures functional independence. • Test the Oswestry Scale for sensitivity and specificity. • Critically evaluate a research paper that includes a randomized control trial for physical therapy intervention. • Define the type of statistics that could be used to determine immediate and long-term outcomes of two groups of patients/clients with rheumatoid arthritis.

Foundational Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Critically analyze evidence (continued)	• Discuss the common nonsystematic sampling techniques and their strengths/weaknesses: disproportional sampling, cluster sampling, convenience sampling, quota sampling, purposive sampling, and snowball sampling. • Define false positives from the perspective of population distributions. • Identify the dependent, independent, and possible intervening variables in any study. • Describe coding techniques for qualitative data. • Describe common parametric statistics tests and when they are appropriate to use. • Describe common nonparametric statistical tests and when they are appropriate to use. • Interpret reported effect that sample size has in a study. • Describe the differences between statistical significance and clinical significance.	
Summarize and utilize evidence	• Identify different levels of evidence and their relative usefulness in making clinical decisions. • Apply the evidence to a particular clinical question to arrive at a recommendation for clinical practice. • Identify the characteristics of a systematic review of a body of evidence that can be used to assist in clinical decisions. • Critically analyze and apply the scientific evidence on health promotion, exercise, fitness, and wellness.	• Contribute to the APTA Hooked on Evidence database. • Write a Critically Appraised Topic (CAT) on an article about the efficacy of a PT intervention. • Critique information available on the Web related to exercise programs for people with Parkinson disease. • Determine if there is evidence to use ultrasound for healing a pressure sore. • Analyze evidence on efficacy of exercise for weight control.
Epidemiology Analysis of demographic trends Population statistics Clinical epidemiology	• Critically review data on trends using mathematical applications. • Locate and use morbidity and mortality statistics as one basis for physical therapy programming. • Interpret population statistics in terms of supply and demand for physical therapy.	• Project the needs for physical therapists in different geographical areas based on population statistics.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Cardiovascular/Pulmonary		
Cardiac Diseases or conditions of the cardiovascular system that require physical therapy interventions (eg, exercises for coronary artery disease, exercises in preparation of and following a heart transplant). Diseases or conditions of the cardiovascular system that affect systems that should receive physical therapy interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, cardiac limitations in a patient/client who has a spinal cord injury).	• Identify the cardiac conditions that are amenable to physical therapy interventions and describe the underlying pathophysiology. • Identify the cardiac conditions that would affect physical therapy interventions. • Describe the medical and surgical management of patients/clients with cardiac conditions commonly seen by physical therapists. • Discuss the contributions of other health care professionals in the management of patients/clients with cardiac conditions commonly seen by physical therapists. • Explain the impact of aging, gender, and ethnicity on pathophysiology and management of cardiac conditions commonly seen by physical therapists. • Evaluate physical therapy interventions for commonly seen cardiac conditions in terms of their evidence base in the scientific literature. • Differentiate between musculoskeletal disorders and cardiac disorders with similar signs and symptoms. • Identify the general categories, mechanisms of action, risk benefit ratio and implications on physical therapy intervention for the pharmacological agents routinely prescribed for conditions involving the cardiac system. • Identify the results of imaging on the practice of physical therapy with respect to the cardiac system. • Identify the need for various imaging procedures in the examination of the patient/client with cardiac conditions.	• Examine and evaluate a 65-year-old patient/client with congestive heart failure. Plan and implement a physical therapy program for this patient/client. • Compare and contrast the physical therapy management of a 3-year-old patient's/client's status post surgical repair of Tetralogy of Fallot, and an 80-year-old patient's/client's status post aortic valve replacement in terms of goals, interventions, prognosis, and precautions. • Plan a physical therapy program for a patient/client status post acute myocardial infarction; justify this intervention based on pathophysiology and natural history of myocardial infarction. • Examine and evaluate a 45-year-old African-American woman who has a family history of heart disease. Plan and implement a physical therapy program for this patient/client. • Plan a physical therapy intervention program patient/client status post heart transplantation; justify the program based on available evidence. • Describe the clinical signs and symptoms of congestive heart failure. • Estimate the likely effects of beta-adrenergic blocking medications on response to physical therapy intervention in a 58-year-old woman with coronary artery disease. • Compare and contrast the signs and symptoms of angina pectoris with those of musculoskeletal disorders of the chest wall.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Vascular Diseases, injuries, or conditions of the vascular system that require physical therapist interventions (eg, exercise programs to promote wellness in persons with essential hypertension, peripheral vascular disease, hypercholesterolemia, etc). Diseases, injuries, or conditions of the vascular system that affect systems that should receive physical therapist interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, maximum blood pressure limitations during exercise).	• Use results of various imaging procedures for the cardiac system in patient/client management. • Identify the vascular conditions that are amenable to physical therapist interventions and describe the underlying pathophysiology. • Describe the pathophysiology of vascular conditions commonly seen by physical therapists. • Explain the medical and surgical management of patients/clients with vascular conditions commonly seen by physical therapists. • Discuss the contributions of other health care professionals in the management of patients/ clients with vascular conditions commonly seen by physical therapists. • Describe the pathology of vascular conditions. • Explain the impact of aging, gender, and race/ethnicity on the pathophysiology and management of vascular conditions commonly seen by physical therapists. • Evaluate physical therapist interventions for commonly seen vascular conditions in terms of their evidence base in the scientific literature. • Differentiate between vascular disease and neurological disease with similar signs and symptoms. • Identify the general categories, mechanisms of action, risk-benefit ratio, and implications on physical therapist intervention for the pharmacological agents routinely prescribed for conditions involving the vascular system. • Identify the results of imaging on the practice of physical therapy with respect to the vascular system.	• Identify physical therapist interventions that might exacerbate the side effects of anticoagulants. • Identify the imaging techniques used to diagnose coronary artery disease. • Examine and evaluate a 45-year-old man who had a middle cerebral artery aneurysm 5 days ago and who has mild hemiplegia. Plan and implement a physical therapy program for this patient/client. • Review the signs and symptoms expected in a 58-year-old Caucasian man with arterial insufficiency and a 600-pack-per-year history of cigarette smoking. Plan and implement a physical therapist intervention program for this patient/client. Include precautions and recommendations regarding the patient's/client's educational and psychological needs. • Describe the early postoperative clinical presentation of a 21-year-old woman status post aneurysm clipping with a resultant right hemiplegia. • Estimate the likely effects of calcium-channel–blocking medications on responses to physical therapist interventions in a 48-year-old man with hypertension. • Compare and contrast the signs and symptoms of occlusive arterial disease of the lower extremities with those of radiculopathy. • Interpret the literature on anticoagulants and formulate a plan to manage patients/clients with deep venous thrombosis (DVT). • Identify the imaging techniques routinely prescribed for DVT.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Pulmonary Diseases, injuries, or conditions of the pulmonary system that require physical therapy interventions (eg, increasing aerobic capacity following lung transplant). Diseases, injuries, or conditions of the pulmonary system that affect systems that should receive physical therapy interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, monitoring dyspnea in a patient/client with emphysema).	• Identify the need for various imaging procedures in the examination of the patient/client with vascular conditions. • Use results of various imaging procedures for the vascular system in patient/client management. • Identify the pulmonary conditions that are amenable to physical therapy interventions and describe the underlying pathophysiology. • Describe the pathophysiology of pulmonary conditions commonly seen by physical therapists. • Identify the results of imaging on the practice of physical therapy with respect to the pulmonary system. • Identify the need for various imaging procedures in the examination of the patient/client with pulmonary conditions. • Use results of various imaging procedures for the pulmonary system in patient/client management. • Identify the genetic risk and predisposition for selected pulmonary diseases. • Describe the medical and surgical management of patients/clients with pulmonary conditions commonly seen by physical therapists. • Discuss the contributions of other health care professionals to the management of patients/ clients with pulmonary conditions commonly seen by physical therapists. • Describe the impact of aging, gender, and ethnicity on pathophysiology and management of pulmonary conditions commonly seen by physical therapists. • Evaluate physical therapy interventions for commonly seen pulmonary conditions in terms of their evidence base in the scientific literature.	• Examine and evaluate a 10-year-old boy with cystic fibrosis. Plan and implement a physical therapy program for this patient/client. • Describe the signs and symptoms of a patient/client with chronic obstructive pulmonary disease. • Identify the imaging procedures used in the assessment of tuberculosis. • Compare and contrast different airway-clearance techniques in terms of effectiveness, cost, and convenience. • Examine and evaluate an 82-year-old woman with burns involving the respiratory tract and 25% of the body surface area. Plan and implement a physical therapy intervention program for this patient/client. • Describe the clinical signs and symptoms of a 60-year-old Caucasian man with moderately severe chronic obstructive pulmonary disease (COPD). • Describe the role of physical therapy in the early postoperative management of a 48-year-old Hispanic woman status post right pneumonectomy. • Estimate the likely effects of beta-adrenergic agonist medications on responses to physical therapy intervention in a 12-year-old girl with asthma. • Compare and contrast the signs and symptoms of a lung tumor with those of musculoskeletal disorders of the upper extremity. • Identify some issues regarding exercise and obstructive disorders and how medication may be used to improve exercise performance.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Pulmonary (continued)	• Differentiate between pulmonary disease and musculoskeletal disease with similar signs and symptoms. • Identify the general categories, mechanisms of action, risk benefit ratio and implications on physical therapy intervention for the pharmacological agents routinely prescribed for obstructive disorders.	
Endocrine and Metabolic		
Endocrine Diseases or conditions of the endocrine system that require physical therapy interventions (eg, gait training for patient/client with ataxia due to myxedema). Diseases or conditions of the endocrine system that affect systems that should receive physical therapy interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, alteration of blood-sugar level during endurance training in patients/clients with diabetes or hypoglycemia).	• Identify the endocrine conditions that are amenable to physical therapy interventions and describe the underlying pathophysiology. • Describe the pathological conditions of the endocrine system commonly encountered by physical therapists. • Discuss impairments that may result from conditions of the endocrine system. • Describe the general categories and mechanism of action for steroids. • Identify the results of imaging on the practice of physical therapy with respect to the endocrine system. • Identify the need for various imaging procedures in the examination of the patient/client with endocrine conditions. • Use results of various imaging procedures for the endocrine system in patient/client management.	• Following examination and evaluation, plan and implement a physical therapy intervention for a 50-year-old patient/client with diabetes mellitus, type I, and status post transtibial (below-knee) amputation secondary to vascular insufficiency. • Discuss the medical management of a 49-year-old African-American woman with diabetes mellitus and a transfemoral (above-knee) amputation. • Describe exercises, indications, and contraindications for individuals with pathological conditions of the endocrine systems. • Describe and conduct safe exercise programs for patients/clients with various pathological conditions of the endocrine system. • Assist a patient with diabetes in planning an exercise/drug routine that avoids hypoglycemia. • Differentiate between insulin and oral antidiabetic agents with respect to their mechanism of action, route of administration, adverse effects, and implications for physical therapy. • Identify the use of various imaging procedures in the management of diabetes mellitus.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Metabolic Diseases of metabolism that require physical therapy interventions (eg, development sequence for patient/client with mental retardation due to phenylketonuria). Diseases of metabolism that affect systems that should receive physical therapy (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, effect of foot changes due to gout on gait training for a patient/client following a cerebrovascular accident).	• Explain the medical and surgical management of pathological conditions of the metabolic system commonly seen by physical therapists. • Discuss the contributions of other types of health care professionalism in the management of pathological conditions of the metabolic system commonly seen by physical therapists. • Identify the results of imaging on the practice of physical therapy with respect to the metabolic system. • Identify the need for various imaging procedures in the examination of the patient/client with metabolic conditions. • Use results of various imaging procedures for the metabolic system in patient/client management.	• Select a practice pattern for a 64-year-old woman with osteoporosis who has decreased endurance and some middle back pain. Outline possible interventions and provide a prognosis based on the examination, evaluation, and diagnosis of this patient/client. • Identify the use of various imaging procedures for management of the patient/client with hyperthyroidism.
Gastrointestinal, Genitourinary		
Gastrointestinal Diseases or conditions of the gastrointestinal system that require physical therapy interventions (eg, mobility for bowel motility).	• Identify the gastrointestinal conditions that are amenable to physical therapy interventions and describe the underlying pathophysiology. • Describe the pathological conditions of the gastrointestinal system commonly encountered by physical therapists. • Describe the medical and surgical management of pathological conditions of the gastrointestinal system commonly seen by physical therapists. • Discuss the contributions of other health care professionals in the management of pathological conditions of the gastrointestinal system commonly seen by physical therapists. • Discuss impairments that may result from conditions of the gastrointestinal system.	• Differentiate between pain of gastrointestinal origin and pain of musculoskeletal origin and make a referral to an appropriate health care provider. • Identify the imaging techniques used to diagnose colon cancer. • Select a practice pattern for a 30-year-old man with hepatitis C. Outline possible interventions and provide a prognosis based on the examination, evaluation, and diagnosis of this patient/client.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Gastrointestinal (continued) Diseases or conditions of the gastrointestinal system that affect conditions that should receive physical therapy interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, liver disease, cancer of the stomach, diseases that impede absorption).	• Identify the results of imaging on the practice of physical therapy with respect to the gastrointestinal system. • Identify the need for various imaging procedures in the examination of the patient/client with gastrointestinal conditions. • Use results of various imaging procedures for the gastrointestinal system in patient/client management.	
Genitourinary Diseases or conditions of the genitourinary system that require physical therapy interventions (eg, pelvic floor muscle atrophy). Diseases or conditions of the genitourinary system that affect systems that should receive physical therapy interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, renal disease).	• Identify the genitourinary conditions that are amenable to physical therapy interventions and describe the underlying pathophysiology. • Describe the pathological conditions of the genitourinary system commonly encountered by physical therapists. • Describe the medical and surgical management of pathological conditions of the genitourinary system commonly seen by physical therapists. • Identify the general categories, mechanisms of action, risk benefit ratio, and implications on physical therapy intervention for the pharmacological agents routinely prescribed for conditions involving the urinary system. • Discuss the contributions of other health care professionals to the management of pathological conditions of the genitourinary system commonly seen by physical therapists. • Discuss gender-specific etiology, signs, and symptoms of genitourinary disease. • Discuss impairments that may result from conditions of the genitourinary system. • Identify the results of imaging on the practice of physical therapy with respect to the genitourinary system.	• Examine and evaluate a 40-year-old woman with a kidney transplant. Plan and implement a physical therapy program for this patient/client. • Describe the role of physical therapy for a 30-year old woman receiving chemotherapy for ovarian cancer. • Describe the signs and symptoms associated with pelvic floor dysfunction in a 48-year-old woman who has had four pregnancies with four full-term vaginal deliveries. • Explain the kinematic relationships between the diaphragm, the abdominal muscles, and the pelvic floor muscles. • Select a practice pattern for a 55-year-old man with chronic renal failure. Outline possible interventions and provide a prognosis based on the examination, evaluation, and diagnosis of this patient/client. • Discuss the anticholinergic drugs used for bladder and fecal incontinence and their implications for physical therapy interventions and cardiac precautions. • Use the results of various imaging procedures for management of the patient/client with pelvic inflammatory disease.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Genitourinary (continued)	• Identify the need for various imaging procedures in the examination of the patient/client with genitourinary conditions. • Use results of various imaging procedures for the genitourinary system in patient/client management.	
Integumentary		
Integumentary Diseases, injuries, or conditions of the integumentary system that require physical therapy interventions (eg, wounds, burns). Diseases, injuries, or conditions of the integumentary system that affect systems that should receive physical therapy interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, bacterial infections of the skin).	• Identify the integumentary conditions that are amenable to physical therapy interventions and describe the underlying pathophysiology. • Describe the pathological conditions of the integumentary system commonly encountered by physical therapists. • Describe the medical and surgical management pathological conditions of the integumentary system commonly seen by physical therapists. • Discuss the contributions of other health care professionals in the management of pathological conditions of the integumentary system commonly seen by physical therapists. • Describe the indications and contraindications of various therapeutic modalities used by physical therapists in the management of wounds and ulcers. • Discuss impairments that may result from conditions of the integumentary system. • Identify the pharmacological agents routinely prescribed for bacterial skin infections. • Identify the results of imaging on the practice of physical therapy with respect to the integumentary system. • Identify the need for various imaging procedures in the examination of the patient/client with integumentary conditions.	• Examine and evaluate a 25-year-old patient/client with an infected, full-thickness wound (5x2.5cm) that is not healing. Plan and implement a physical therapy program for this patient/client. • Identify the signs and symptoms associated with psoriasis in a 56-year-old Caucasian man. • Differentiate between the physical findings and patient/client symptoms associated with venous and arterial insufficiency. • Given a specific clinical problem of a patient/client with an open wound, develop a wound stage/depth diagnosis and plan of care. • Determine the predominant etiology and provide treatment for a 60-year-old Hispanic woman with diabetes mellitus, type II, and a foot burn. • Select footwear for a 65-year-old man with peripheral neuropathy and a history of forefoot ulcer. • Select a practice pattern for a 75-year-old patient/client with a noninfected, partial thickness venous ulcer (25x5 cm) that is not healing. Outline possible interventions and provide a prognosis based on the examination, evaluation, and diagnosis of this patient/client.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Integumentary (continued)	• Use results of various imaging procedures for the integumentary system in patient/client management.	• Discuss one topical agent used for the management or prevention of wound infections commonly seen in physical therapy practice. Discuss the type of organism the agent is active against, how the agent is applied, and any side effects that may occur.
Musculoskeletal		
Skeletal Diseases, injuries, or conditions of the skeletal system that require physical therapist interventions (eg, epiphyseal plate injuries, congenital hip dysplasia, stress fractures). Diseases, injuries, or conditions of the skeletal system that affect systems that should receive physical therapy interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, fracture of a femur of a middle-aged woman with high blood pressure).	• Identify the musculoskeletal conditions amenable to physical therapy interventions and describe the underlying pathophysiology. • Describe the pathological conditions of the skeletal system commonly encountered by physical therapists. • Describe the medical and surgical management of pathological conditions of the skeletal system commonly seen by physical therapists. • Describe the contributions of health care professionals other than physical therapists in the management of pathological conditions of the skeletal system commonly seen by physical therapists. • Identify the general categories, mechanisms of action, risk-benefit ratio, and implications on physical therapy interventions for the pharmacological agents routinely prescribed for relief of pain in the muscular system. • Identify the results of imaging on the practice of physical therapy with respect to the skeletal system. • Identify the need for various imaging procedures in the examination of the patient/client with skeletal conditions. • Use results of various imaging procedures for the skeletal system in patient/client management.	• Develop an examination and plan of care for a 32-year-old woman recovering from an exacerbation of rheumatoid arthritis who has suffered from subluxation in the joints of her hands when working as a data-entry clerk. • Describe the common genetic risk factors and health behaviors that could lead to osteoporosis in a 66-year-old Caucasian woman. • Describe the postoperative movement restrictions on a 50-year-old patient/client with a total hip replacement where an anterior surgical approach was used. • Develop an examination and intervention plan for a 12-year-old girl with idiopathic scoliosis and primary thoracic curve of 32 degrees. • Develop a fitness program for a 40-year-old man with degenerative joint disease of both knees. • Describe the differences between nonsteriodal anti-inflammatory drugs (NSAIDS) and acetaminophen in terms of pain relief, indications, and contraindications. • Explain how NSAID use can complicate cardiovascular care. • Identify decreased joint space on plain radiograph at the tibiofemoral joint.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Connective tissue Diseases, injuries, or conditions of connective tissue that affect systems that should receive physical therapy interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, ankle ligament repair for a young man with juvenile rheumatoid arthritis).	• Identify the connective tissue conditions that are amenable to physical therapy interventions and describe the underlying pathophysiology. • Describe the pathological conditions of connective tissue commonly encountered by physical therapists. • Describe the medical and surgical management of pathological conditions of connective tissue commonly seen by physical therapists. • Discuss the contributions of health care professionals other than physical therapists to the management of pathological conditions of connective tissue commonly seen by physical therapists. • Identify the results of imaging on the practice of physical therapy with respect to connective tissue. • Identify the need for various imaging procedures in the examination of the patient/client with connective tissue conditions. • Use results of various imaging procedures for connective tissue in patient/client management.	• Describe the signs of a glenohumeral joint capsular restriction in a 24-year-old weekend canoeist who is complaining of pain and limited motion in his right shoulder. • Describe an examination of a 25-year-old volleyball player who experiences a grade II ankle sprain. Compare and contrast possible interventions and provide a rationale for each. • Compare and contrast two rehabilitation protocols for patients/clients with surgical repair of the anterior cruciate ligament (ACL). • Describe lumbar instability and its proposed causes. Contrast the theoretical bases for two possible interventions for this condition. • Describe the effects of the healing process on the activity level of a 55-year-old recreational runner who is recovering from a repair of the Achilles tendon. • Compare physical examination results with MRI results in the patient/client diagnosed with herniated nucleus pulposus (HNP).
Muscular Diseases, injuries, or conditions of muscle that require physical therapy interventions (eg, muscle contracture, reduced strength related to aging, muscle atrophy due to sedentary lifestyle).	• Identify the muscular conditions that are amenable to physical therapy interventions and describe the underlying pathophysiology. • Describe the pathological conditions of the muscular system commonly encountered by physical therapists. • Describe the medical and surgical management of pathological conditions of the muscular system commonly seen by physical therapists. • Discuss the contributions of health care professionals other than physical therapists to the management of pathological conditions of the muscular system seen by physical therapists.	• Discuss the progressive nature of muscular dystrophy and the implications for the use of orthoses and other assistive devices. • A 33-year-old man who sustained a C4 level tetraplegia has been diagnosed with myositis ossificans in the right triceps muscle. Describe the possible interventions and provide the rationale for each. • Identify the imaging procedures often used in the assessment of Achilles tenosynovitis.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Muscular (continued) Diseases, injuries, or conditions of muscle that affect systems that should receive physical therapy interventions (eg, co-morbidities) and conditions that influences the type of intervention that can be given (eg, rotator cuff repair of an elderly man with emphysema).	• Identify the results of imaging on the practice of physical therapy with respect to the muscular system. • Identify the need for various imaging procedures in the examination of the patient/client with muscular conditions. • Use results of various imaging procedures for the muscular system in patient/client management.	
Neuromuscular		
Central nervous system (CNS) Peripheral nervous system (PNS) Autonomic nervous system (ANS) Diseases, injuries, or conditions of the neuromuscular (CNS, PNS, ANS) system that require physical therapy interventions (eg, gait and balance training post hemiparesis). Diseases, injuries, or conditions of the neuromuscular (CNS, PNS, ANS) system that affect systems which should receive physical therapy interventions (eg, comorbidities) and conditions that influence the type of intervention that can be given (eg, proper positioning to prevent pressure ulcers in a flaccid extremity).	• Identify the neuromuscular conditions that are amenable to physical therapy interventions and describe the underlying pathophysiology. • Describe the pathological conditions of the neuromuscular system commonly encountered by physical therapists. • Describe the medical and surgical management of pathological conditions of the neuromuscular system commonly seen by physical therapists. • Discuss the contributions of health care professionals other than physical therapists to the management of pathological conditions of the neuromuscular system commonly seen by physical therapists. • Identify the general categories, mechanisms of action, risk benefit ratio and implications on physical therapy intervention for the pharmacological agents routinely prescribed for conditions involving the neuromuscular system. • Identify the results of imaging on the practice of physical therapy with respect to the neuromuscular system.	• Develop an examination and intervention plan for a 79-year-old woman with cerebral vascular accident (CVA) who demonstrates signs of cerebellar involvement. • A 30-year-old woman has a history of loss of sight and peripheral weakness. Describe the signs and symptoms you would expect to see to confirm multiple sclerosis (MS). • Discuss the medical and physical therapy short-term management of an 18-year-old man with a C7 cord transection. • Describe the usual potential return of function, signs, and symptoms expected in a 5-year-old boy with closed brain injury and cerebral anoxia. • Describe the role of nerve growth factor in the healing process of peripheral nerves and cite literature concerning the effects of electrotherapy on both severed nerves and nerve growth factor. • Describe the pathomechanical changes to the nerves of the wrists associated with carpal tunnel syndrome.

Clinical Sciences Matrix

Primary Content	Examples of Terminal Behavioral Objectives *After the completion of the content, the student will be able to...*	Examples of Instructional Objectives
Central nervous system (CNS) (continued) Peripheral nervous system (PNS) (continued) Autonomic nervous system (ANS) (continued)	• Identify the need for various imaging procedures in the examination of the patient/client with neuromuscular condition. • Use results of various imaging procedures for the neuromuscular system in patient/client management.	• Describe the straight-leg raising test and identify what is suspected with positive findings. • Describe the symptoms caused by the ANS that would commonly be reported by a patient/client with a C5-6 tetraplegia. • Differentiate between vestibular and multisensory balance disorders using results of clinical tests and measures, including the clinical test of sensory integration in balance and the Hallpike-Dix maneuver. • Identify the factors that distinguish reflex sympathetic dystrophy from the typical discomfort that occurs after prolonged upper-extremity casting. • Identify strategies for managing drug side effects, like sedation, that may negatively impact physical therapy interventions. • Identify drugs to reduce abnormal movement patterns in patients/clients with multiple sclerosis, spinal cord injury, cerebral palsy, and stroke. • Identify the various imaging procedures used in the diagnosis of traumatic brain injury.