

Course Number and Title: EXS 101 Functional Kinesiology

Campus Location:

Wilmington

Effective Date:

2022-51

Prerequisite:

BIO 120, MAT 162, SSC 100 or concurrent

Co-Requisites:

None

Course Credits and Hours:

3.00 credits

2.00 lecture hours/week

2.00 lab hours/week

Course Description:

The study of the relationship between the muscular and skeletal systems acting to provide motion through the biomechanical leverage system. The course will focus on the biomechanics of muscular actions during strength training exercises and cardiovascular exercises using various types of equipment.

Required Text(s):

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:

Exercise Science Program Manual

Allied Health/Science Department Policy Manual

Schedule Type:

Classroom Course

Disclaimer:

None

Core Course Performance Objectives (CCPOs):

1. Appraise how the general principles of kinesiology, muscle and joint structure, and function relate to exercise science. (CCC 1, 2, 5, 6; PGC 2, 7, 8)
2. Explain the skeletomuscular structure, biomechanics, and function of the torso, neck, and head and their effects on postural alignment. (CCC 2, 3; PGC 2, 7, 8)
3. Demonstrate how skeletomuscular structure and biomechanics affect function of various portions of the upper extremity. (CCC 2; PGC 2, 7, 8)
4. Demonstrate how skeletomuscular structure and biomechanics affect function of various portions the lower extremity. (CCC 2, 6, 9; PGC 2, 7, 8, 9)
5. Explain how gait is affected by biomechanical factors during exercise. (CCC 2, 6; PGC 2, 7, 8, 9)
6. Perform and describe various protocols used in clinical settings to evaluate fitness performance. (CCC 2, 6; PGC 2, 3, 4, 5, 6, 7, 8, 9)
7. Identify and perform appropriately the components of professional behaviors as applied in the classroom and lab activities. (CCC 3, 4; PGC 1, 5)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):

Upon completion of this course, the student will:

1. Appraise how the general principles of kinesiology, muscle and joint structure, and function relate to exercise science.
 1. Review the planes of the body and directional terms used in describing anatomical structures and functions.
 2. Review the names, descriptions, and examples of various types of joints in the body.
 3. Describe the joint capsule.
 4. Demonstrate the various joint movements of the body, including axes of rotation.
 5. Describe three types of motion, planes of motion, and directions of motion.
 6. Describe the muscular system incorporating the following:
 1. The elements and mechanics of muscular action
 2. Levers and muscular action
 3. Types of contraction
 4. Determination of the actions of muscles
 5. Integration of muscular action
 6. Description of the consequences of muscle contraction
 7. Effects of training and exercise on muscle
 7. Analyze joint structure and function, including but not limited to the following:
 1. The relationship between stability and mobility
 2. The four basic principles of joint structure

3. An open versus a closed kinetic chain
4. Rolling, sliding, and spinning
5. Loose pack versus closed pack
6. Hypomobility versus hypermobility
7. The basic effects of injury and disease on joints
8. How the convex-concave relationship affects joint motion
8. Describe how muscle fiber types and arrangement affect muscle tension and length/tension ratio.
9. List and explain the various classifications of muscles such as synergist, antagonist, shunt, spurt, tonic, and phasic.
10. Explain passive insufficiency and active insufficiency.
11. Describe machines used in testing muscular strength, power, and endurance.
12. Describe general principle of kinesiology/biomechanics and how it relates to exercise science.
13. Define *arthrokinematics*, *osteokinematics*, *kinetics*, and *static biomechanics*.
14. Describe the three lever systems.
15. Discuss Newton's laws.
16. Define *line of gravity*, *center of gravity*, *lever arm*, *moment arm*, and *torque* and identify them.
17. Sketch and label free body diagrams.
18. Discuss the clinical relevance of changing the moment arm of the resistance.
19. Explain general concepts of range of motion and muscle testing.
20. Define *internal forces* and *external forces*.
21. Explain friction and its relationship to contacting surfaces and to the applied forces.
22. Explain concurrent and parallel and linear force systems.
23. Define *force couple*.
2. Explain the skeletomuscular structure, biomechanics, and function of the torso, neck and head and their effects on postural alignment.
 1. Review the different types of vertebra.
 2. Review the four main functions of the vertebral column.
 3. Describe the various components of the vertebral column, such as muscles, discs, and ligaments and explain their functions.
 4. Describe the movements of the vertebral column.
 5. Describe how the moment arm changes as the trunk changes position.
 6. Explain the biomechanical responses to motion.
 7. Explain the unique regional differences of the vertebral column and how those differences affect motion.
 8. Describe the general effects of aging and injury to the vertebral column.
 9. Describe the biomechanics of various strength training exercises for the muscles of the vertebrae, including but not limited to trunk extension, flexion, and rotation.
 10. Describe optimal posture.
 11. Define and analyze posture with respect to different joints.
 12. Describe the effects of decreased muscular strength in the trunk and in other parts of the body (e.g., quads) and their relationship to posture.
 13. Explain how the line of gravity affects joint motion.
 14. Describe the movements of the head and neck.
 15. Discuss the biomechanics of sit-ups and crunches.
3. Demonstrate how skeletomuscular structure and biomechanics affect function of various portions of the upper extremity.
 1. Name and describe the structures associated with the scapula and clavicle.
 2. Describe concave and convex surfaces of the shoulder.
 3. Identify and palpate the jugular notch, sternal angle, epigastric fossa, and the hollow of the axilla.
 4. Describe the different end feels in joints.
 5. Describe the shoulder joint in terms of the
 1. glenoid labrum.
 2. subscapular bursa.
 3. rotator cuff.
 6. Describe the joints directly associated with the shoulder, their functions, and the normal range of motion (ROM).
 7. Name the ligaments associated with the sternoclavicular, acromioclavicular, and glenohumeral joints.
 8. Sketch, identify, and label all portions of the brachial plexus.
 9. Describe the blood supply to the shoulder.
 10. Identify the proximal attachment (PA), distal attachment (DA), and action of the muscles of the axilla, pectoral region, and shoulder proper.
 11. Describe the supraspinatus, infraspinatus, teres minor, and subscapularis (SITS) muscles.
 12. Describe the type(s) of movements ligaments associated with the sternoclavicular, acromioclavicular, and shoulder joints.
 13. Describe dynamic and passive stability of the shoulder.
 14. Describe the effects of immobilization on normal motion of the shoulder.
 15. Explain the force couple for glenohumeral elevation.
 16. Explain the role of the sternoclavicular and acromioclavicular joints in scapulo-humeral rhythm.
 17. Describe the biomechanics of various strength training exercises for the shoulder, including but not limited to
 1. shoulder press.
 2. bench press.
 3. side arm raises.
 4. front arm raises.
 18. Describe the surface anatomy of the arm.
 19. Describe the cubital fossa.
 20. Name and describe the ligaments of the elbow joint.
 21. Name the boundaries of the axillary fossa.
 22. Identify the PA, DA, and action of the anterior and posterior compartment muscles.
 23. Describe the biomechanics of various strength training exercises for the arm, including but not limited to
 1. bicep curls.

2. triceps extensions.
3. forearm curls.
24. Describe and palpate the surface features of the forearm and hand, including the following:
 1. Olecranon process
 2. Posterior border of the ulna
 3. Head of the ulna
 4. Head of the radius
 5. Styloid process of the radius
 6. Anatomical snuff box
 7. Dorsal tubercle of the radius
 8. Carpal bones
 9. Metacarpals
 10. Phalanges
 11. Pisiform bone
 12. Hook of the hamate
 13. Flexor retinaculum
 14. Palmar aponeurosis
25. Describe the various joints of the elbow, wrist, and hand, their function and normal range of motion, dynamic and passive stabilizers, and their functional relationships to each other.
26. Identify the PA, DA, and action of the flexor and extensor forearm muscles.
27. Describe the movements of the radio-ulnar joints.
28. Describe the movements of the forearm, wrist, thumb, and digits.
29. Describe carrying angle.
30. Describe the functional position of the wrist and hand.
31. Discuss the biomechanics of the various grips used for weight training.
4. Demonstrate how skeletomuscular structure and biomechanics affect function of various portions the lower extremity.
 1. Identify and palpate the various surface structures of the hip.
 2. Describe how the structure of the hip is related to its function.
 3. Name and describe the joints and associated ligaments of the pelvis.
 4. Identify the PA, DA, and action of the hip muscles.
 5. Describe and demonstrate the movements of the hip joint.
 6. Describe coordinated movements of the femur, pelvis, and lumbar spine.
 7. Discuss the importance of pelvic position (positive tilt, negative tilt, neutral) with various exercises.
 8. Identify and palpate the various surface structures of the thigh and knee.
 9. Describe the various joints, their structures, functions, ROM, and dynamic and passive stabilizers of the thigh and knee.
 10. Identify all features of the femur.
 11. Describe the hip and knee angulations, including the quadriceps angle (Q angle).
 12. Name and describe the ligaments and cartilages of the knee joint.
 13. Identify the PA, DA, action, of the anterior thigh muscles.
 14. Identify the PA, DA, and action of the adductor thigh muscles.
 15. Identify the PA, DA, and action of the posterior thigh muscles.
 16. Describe the movements of the knee joint.
 17. Explain how the patella increases the moment arm of the quads.
 18. Describe coordinated movements of the femur, the pelvis, and the lumbar spine.
 19. Describe the biomechanics of various strength training exercises for the thigh and knee, including but not limited to
 1. leg extensions.
 2. leg curls.
 3. squats.
 20. Identify the PA, DA, and action of the buttock muscles and the deep external rotators of the hip.
 21. Identify all portions of the tibia and fibula.
 22. Describe the significance and boundaries of the popliteal fossa.
 23. Describe the formation and associated ligaments of the proximal and distal tibiofibular joints.
 24. Identify the PA, DA, and action of the muscles of the posterior compartment of the leg.
 25. Identify the PA, DA, and action of the anterior leg muscles.
 26. Describe the biomechanics of various strength training exercises for flexors, extensors, adductors, and abductors of the leg.
 27. Identify all portions of the tarsus, metatarsus, and phalanges.
 28. Describe the plantar aponeurosis.
 29. Describe the arches of the foot.
 30. Describe the various segments of the foot.
 31. Describe the various joints, their structures, functions, ROM, and dynamic and passive stabilizers of the foot.
 32. Name and describe the various ligaments associated with the ankle joint.
 33. Identify the PA, DA, and action of the intrinsic muscles of the foot.
 34. Describe common structural dysfunctions of the foot.
 35. Describe the normal weight distribution of the foot.
5. Explain how gait is affected by biomechanical factors during exercise.
 1. Describe the various components of the gait cycle in traditional terms and Rancho Los Amigos terms (RLA).
 2. Describe internal and external forces that affect gait.
 3. Explain how muscle weakness and paralysis of the trunk, upper extremities (UEs), and lower extremities (LEs) affect gait.
 4. Analyze the gait cycle on various subjects.
 5. Explain the role of the muscles of the LE during each phase of the gait cycle.
 6. Explain the gait cycle in jogging and running.
6. Perform and describe various protocols used in clinical settings to evaluate fitness performance.

1. Perform functional analysis of the upper extremities.
2. Palpate various anatomical structures of upper extremities.
3. Perform functional analysis of the lower extremities.
4. Palpate various anatomical structures of lower extremities.
5. Palpate various anatomical structures of vertebral column and ribs.
6. Perform gait analysis.
7. Analyze plyometric training for the upper and lower extremities.
8. Analyze various stretching techniques.
9. Perform movement analysis of various fitness tests, including, but not limited to: sit and reach, sit-ups, push-ups, grip dynamometers.
10. Perform movement analysis of cycle ergometry, ellipticals, stair climbers, and treadmills.
11. Perform movement analysis of various strength training exercises, including but not limited to
 1. Squats.
 2. Leg press.
 3. Leg extension.
 4. Heel raises.
 5. Bench press.
 6. Shoulder press.
 7. Lateral arm raises.
 8. Bicep curls.
 9. Tricep extensions.
 10. Wrist curls.
7. Identify and perform appropriately the components of professional behaviors as applied in the classroom and lab activities.
 1. Describe the professional behaviors and attributes of the professional behaviors tool.
 2. Perform a self-assessment on each behavior of the professional behaviors tool at least one time during this course.
 3. Demonstrate competence in the professional behaviors identified below:
 1. Professionalism and responsibility
 2. Interpersonal skills and communication skills
 3. Nonverbal communication
 4. Commitment to learning and effective use of time and resources
 5. Use of constructive feedback
 6. Problem-solving and critical thinking
 7. Stress management

Evaluation Criteria/Policies:

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Unit Exams (3) equally weighted (summative)	42%
Quizzes (2) equally weighted (formative)	6.5%
Presentations (2) equally weighted (summative)	6.5%
Notebook (3) equally weighted (formative)	10%
Laboratory Practical Exams (2) equally weighted (summative)	25%
Laboratory Reports (10) equally weighted (formative)	10%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Integrate professional behaviors in an ethical, legal, safe, and effective manner within the exercise science delivery system.
2. Perform appropriate measurement and assessment techniques to assist in evaluating a client's status for proper exercise prescription plans.
3. Prescribe and implement or modify a comprehensive exercise prescription plan based upon pre-exercise screenings or re-evaluation of clients.
4. Demonstrate effective written, oral, and nonverbal communication skills with clients, their families, colleagues, health care providers, and the public.
5. Participate in the teaching and explaining of exercise science concepts to clients, colleagues and the public.
6. Recognize the importance of continued development of knowledge and skills through the practice of reading professional literature and attending continuing education activities.
7. Perform clinical practice, as required of an entry-level Certified Exercise Science professional.

Disabilities Support Statement:

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.