

EXERCISE SCIENCE/SPORTS MEDICINE

Levels: 11-12
Units of Credit: 1.00
CIP Code: 51.0913
Core Code: 36-01-0000-040/36-01-0013-040
Prerequisite: None, MAP Recommended
Skill Test: #701

COURSE DESCRIPTION

This full-year course is designed to teach students components of exercise science/sports medicine; including exploration of therapeutic careers, medical terminology, anatomy and physiology, first aid, injury prevention principles, the healing process, rehabilitation techniques, therapeutic modalities, sport nutrition, sport psychology, and performance enhancement philosophies.

CORE STANDARDS, OBJECTIVES, AND INDICATORS

STANDARD 1

Students will explore the fundamental aspects of Exercise Science/Sports Medicine.

Objective 1: Identify members of the Sports Medicine team.

- a. Recognize the primary members of the sports medicine team to include: Coach, Athlete, Parents, Team Physician, and Certified Athletic Trainer, and Allied Health professionals.
- b. Understand that other careers provide support to the sports medicine team.
- c. Compare and contrast the roles of each member of the sports medicine team.

Objective 2: Explore a variety of therapeutic careers and describe the job duties and skills, education required, job settings, and potential salary for:

- a. Certified Athletic Trainer
- b. Physical Therapist
- c. Physical Therapy Assistant
- d. Physical Therapy Aide
- e. Occupational Therapist
- f. Occupational Therapy Assistant
- g. Occupational Therapy Aide
- h. Exercise Physiologist
- i. Orthopedic Surgeon
- j. Physician
- k. Physician Assistant
- l. Massage Therapist
- m. Chiropractor
- n. Sports Psychologist
- o. Certified Strength & Conditional Specialist/Personal Trainer
- p. Dietician
- q. Podiatrist

Objective 3: Explain legal issues and legal terminology.

- a. Discuss risk management in an athletic setting (collision, contact, non-contact; surfaces).
- b. Define legal terminology and discuss issues including:
 1. Assumption of Risk
 2. Battery
 3. Commission and Omission
 4. Failure to Warn
 5. HIPAA

6. Informed Consent
 7. Liability
 8. Malpractice
 9. Negligence (Duty of care, breach of duty, damage/injury, proximal cause)
 10. Standard of Care
- c. Discuss parameters of ethical conduct and associated issues including:
1. Americans with Disabilities Act
 2. Cheating
 3. Drug testing
 4. Fair play and sportsmanship
 5. Performance enhancing drugs
 6. Scope of practice
 7. Title IX (Gender equity in sports)
 8. Winning at all costs
- d. Review preventative measures to reduce potential risks of litigation.
1. Be familiar with athletes
 2. Carry liability insurance
 3. Continuing education
 4. Demonstrate appropriate documentation (SOAP)
 5. Follow physician orders and recommendations
 6. Have an emergency action plan
 7. Maintain adequate supervision
 8. Maintain good rapport with the Sports Medicine Team

STANDARD 2

Students will apply medical terminology.

Objective 1: Identify and utilize anatomical positions, planes, and directional terms.

- a. Demonstrate what anatomical position is and how it is used to reference the body.
- b. Distinguish between the commonly used anatomical planes and recognize their individual views.
 1. Sagittal / Midsagittal Plane
 2. Frontal / Coronal Plane
 3. Transverse / Horizontal Plane
- c. Apply directional terms to their location on the human body.
 1. Superior / Inferior
 2. Anterior / Posterior
 3. Medial / Lateral
 4. Distal / Proximal
 5. Superficial / Deep
 6. Ventral / Dorsal
 7. Prone / Supine
 8. Unilateral / Bilateral

Objective 2: Demonstrate body movements.

- a. Compare and contrast the various movements of the body and their counter-movements.
 1. Flexion / Extension / Hyperextension
 2. Adduction / Abduction
 3. Pronation / Supination
 4. Retraction / Protraction
 5. Elevation / Depression
 6. Rotation / Circumduction
 7. External Rotation / Internal Rotation
 8. Lateral Flexion (side-bending left or right)
- b. Compare and contrast the various movements of the foot /ankle and their counter-movements.
 1. Inversion / Eversion

2. Dorsiflexion / Plantarflexion
3. Pronation / Supination
- c. Compare and contrast the lateral movements of the wrist/hand and their counter-movements.
 1. Radial Deviation / Ulnar Deviation
 2. Opposition

Objective 3: Define terms associated with Exercise Science.

- a. Define the terminology that describes common sports injuries.
- b. Define the concepts related to the injury process.

STANDARD 3

Students will apply injury prevention principles.

Objective 1: Describe the basic principles and specialized equipment used in the prevention of athletic injury.

- a. Recognize types and functions of protective equipment.
 1. Helmet / face mask / ear guards
 2. Mouth guards
 3. Neck collars
 4. Padding
 5. Sports bras
 6. Athletic supporter / cup
 7. Shin guards
 8. Shoe
 9. Other sport specific protection devices
- b. Discuss the legal ramifications of manufacturing, buying, and issuing equipment.
 1. NOCSAE warning
 2. Modification of equipment
 3. Proper fit and selection
 4. Use of defective or worn out equipment

Objective 2: Demonstrate theory and principles of prophylactic taping.

- a. Analyze the basic principles of prophylactic taping.
- b. Identify the necessary supplies and their purpose for prophylactic taping.
 1. Athletic tape (various size)
 2. Underwrap
 3. Heel and lace pad
 4. Adhesive spray
 5. Shark / Scissors
- c. Analyze the basic principles of proper tape removal.
- d. Explain the terminology associated with prophylactic taping procedures.
 1. Anchor
 2. Stirrup
 3. Horseshoe
 4. Spica
 5. Heel-Lock
 6. Checkrein / fan
- e. Competently tape an ankle using the standard prophylactic taping method.
- f. Competently tape an arch using the standard prophylactic taping method.
- g. Competently tape a thumb using the standard prophylactic taping method.
- h. Competently tape a wrist using the standard prophylactic taping method.

Objective 3: Identify principles of protective bracing.

- a. Discuss the differences between functional and prophylactic bracing.
- b. Identify the function of joint sleeves (compression).

Standard 4

Students will examine performance enhancement philosophies.

Objective 1: Define terms associated with performance enhancement.

- a. Cardiovascular endurance
- b. Muscular endurance
- c. Power
- d. Speed
- e. Strength

Objective 2: Discuss general conditioning principles.

- a. Adaptation
- b. Overload
- c. Specificity
- d. Reversibility
- e. Periodization

Objective 3: Examine the roll the cardiovascular / respiratory systems have on fitness/athletic performance.

- a. Describe the anatomy of the cardiovascular / respiratory systems.
 1. Heart – 4 chambers, 4 valves, 4 blood vessels
 2. Lungs – oxygen exchange from alveoli to capillaries
- b. Identify vital signs related to the cardiovascular / respiratory system.
 1. Describe and accurately measure blood pressure (systolic / diastolic)
 2. Describe and accurately measure respiratory rate
 3. Describe and accurately measure pulse rate
 4. Describe lung volume
 5. Describe the importance of cardiac output, stroke volume, and heart rate during exercise
- c. Examine different types of tests used to quantify cardiovascular fitness.
 1. VO_{2max}
 2. Harvard step test
 3. 12 minute run test
- d. Describe the effects exercise has on the cardiovascular / respiratory systems.
 1. Immediate effects of exercise (heart rate, ventilation)
 2. Long term effects of exercise (heart rate, stroke volume, cardiac output)
- e. Compare and contrast aerobic / anaerobic training.
- f. Examine the importance of a warm up / cool down in a training program.
- g. Examine different cardiovascular training methods.
 1. Interval
 2. Fartlek
 3. Circuit
 4. Continuous
- h. Apply general conditioning principles to improve cardiovascular fitness.
 1. Rate of perceived exertion (BORG scale)
 2. Target heart rate

Objective 4: Examine the effects of the environment on training and performance.

- a. Discuss the effect of high and low altitude.
- b. Describe the effects of acclimatization.
- c. Recognize the effects of travel on the body.

Objective 5: Examine the roll strength training has on fitness / athletic performance.

- a. Compare and contrast the difference between slow twitch and fast twitch muscles fibers and the type of athletic performance each influence.
- b. Compare and contrast different types of movements related to strength training
 1. Isometric / isotonic / isokinetic
 2. Eccentric / concentric

3. Closed chain / open chain
4. Plyometrics
- c. Identify methods of resistance.
- d. Apply general conditioning principles to improve strength.
 1. Speed
 2. Muscular endurance
 3. Power

Objective 6: Examine the importance of flexibility in fitness / athletic performance.

- a. Explain the general guidelines of flexibility.
 1. Define ROM and how it relates to fitness / athletic performance
 2. Identify the benefits of flexibility
 - a. Decrease risk of injury
 - b. Reduce muscle soreness
 - c. Improve muscular balance and postural awareness
 3. Demonstrate proper timing of flexibility techniques
 - a. Before activity
 - b. After activity
- b. Identify the different methods to increase flexibility and the safety / effectiveness of each.
 1. Static stretching
 2. Ballistic Stretching
 3. Dynamic Stretching
 4. Proprioceptive Neuromuscular Facilitation Stretching
 - a. Contract/Relax
 - b. Hold / Relax

STANDARD 5

Students will explore various aspects of sports nutrition.

Objective 1: Describe the basics components of nutrition.

- a. Utilize the Food Guide Pyramid at www.MyPyramid.gov to recognize the components of a sound diet.
- b. Recognize the basic human needs and the sources of the following nutrients:
 1. Carbohydrates
 2. Proteins
 3. Fats
 4. Vitamins
 5. Minerals
 6. Water

Objective 2: Describe basic body composition.

- a. Define body composition.
- b. Compare and contrast the most common methods for analyzing body composition.
 1. Hydrostatic
 2. Bod Pod
 3. Calipers
 4. BIA
 5. Infrared
- c. Describe the parameters of safe weight loss and weight gain.

Objective 3: Examine the importance of fluid replacement and hydration.

- a. Examine the importance of water and its role in the body.
- b. Explain the correct process of hydration during athletic activity.
 1. Identify the dangers of inappropriate hydration techniques.
 2. Identify the dangers of dehydration.
- c. Compare and contrast advantages and disadvantages of sports drinks.

1. Identify the roll of sports drinks in hydration
2. Discuss the correct chemical make-up of sports drinks.
- d. Discuss the dangers of energy drinks and their effects on the body.

Objective 4: Identify the components of a pre and post event meal and explain the value of each.

- a. Describe recommended nutrient percentages of pre and post event meals.
- b. Identify foods that are easily digested.
- c. Identify foods that should be avoided.
- d. Identify when pre and post event meals should be eaten.
- e. Explain the process of carbohydrate loading and discuss when it is most effective.

Objective 5: Recognize disorders associated with nutrition.

- a. Identify signs, symptoms, and effects of Anorexia Nervosa.
- b. Identify signs, symptoms, and effects of Bulimia Nervosa.
- c. Identify signs, symptoms, and effects of the Female Athlete Triad.

Objective 6: Compare and contrast the physiological and psychological effects of ergogenic aids.

- a. Define ergogenic aid.
- b. Recognize the effects and possible dangers of common ergogenic aides.
 1. Stimulants
 2. Narcotics
 3. Anabolic steroids
 4. Beta blockers
 5. Diuretics
 6. Human growth hormone
 7. Blood doping products
 8. Erythropoietin
 9. Anesthetics
 10. Corticosteroids
 11. Creatine

STANDARD 6

Students will describe the injury and healing process.

Objective 1: Discuss the inflammatory response and the healing process.

- a. Compare and contrast acute and chronic injuries.
- b. Discuss the purpose of inflammation.
- c. Categorize the stages of acute injury healing and explain the processes involved in each:
 1. Acute (Inflammation) Phase
 - a. Signs and symptoms of inflammation (heat, redness, swelling, pain, loss of function)
 - b. Time frame
 - c. Define vasodilatation and explain why it occurs
 - d. Define hypoxia and explain its role in secondary injury
 2. Subacute (Repair and Regeneration) Phase
 - a. Time frame
 - b. Explain what fibroblasts are
 - c. Explain what collagen is and its role in scar tissue formation
 3. Remodeling (Maturation) Phase
 - a. Time frame
 - b. Define adhesions
 - c. Explain Wolff's Law

Objective 2: Compare and contrast injury classifications.

- a. Describe first degree injuries
- b. Describe second degree injuries
- c. Describe third degree injuries

STANDARD 7

Students will be able to recognize common injuries and administer injury management.

Objective 1: Explain an injury assessment (HIPS)

- a. Identify proper PPE / BSI precautions.
- b. Identify the components included in obtaining an accurate history.
- c. Identify the components of an inspection.
- d. Describe the process of palpation.
- e. Describe the purposes of special tests.
 1. Range of Motion
 - a. Passive
 - b. Active
 - c. Resistive
 2. Stress Tests (structural integrity)
 3. Neurological
 4. Functional
- f. Discuss the decisions that can be made from a HIPS evaluation.
- g. Explain a HIPS assessment.

Objective 2: Identify soft tissue injuries and skin conditions.

- a. Differentiate signs and symptoms and treatment for:
 1. Avulsions
 2. Abrasions
 3. Bites
 4. Blisters
 5. Contusions
 6. Lacerations
 7. Stings
- b. Differentiate signs and symptoms and treatment for:
 1. Ring worm
 2. Jock itch
 3. Athlete's foot
 4. Impetigo
 5. MRSA
 6. Warts
 7. Eczema

Objective 3: Recognize abdominal injuries, bleeding, and shock.

- a. Discuss external bleeding.
- b. Demonstrate proper procedures to control bleeding.
 1. Apply direct pressure with sterile gauze pad
 2. Apply a pressure dressing
 3. Check circulation
- c. Identify signs, symptoms, and treatment of internal bleeding.
- d. Identify signs and symptoms and treatment of abdominal injuries.
 1. Ruptured spleen
 2. Appendicitis
 3. Hernia
- e. Describe shock and the treatment for it.

Objective 4: Discuss immobilization techniques.

- a. Identify fracture signs and symptoms.
- b. Explain the steps to immobilization.
 1. Splint in the position found
 2. Immobilize the joint above and the joint below
 3. Check circulation distal to the injury

- c. Explain head / neck immobilization.
 1. Maintain in-line stabilization.
 2. Monitor ABC's.

Objective 5: Describe the treatment for medical conditions.

- a. Seizures
- b. Fainting
- c. Diabetes
- d. Anaphylactic shock
- e. Asthma

Objective 6: Recognize and provide treatment for environmental conditions.

- a. Compare and contrast the causes, signs, symptoms, and treatment of heat illnesses.
 1. Heat cramps
 2. Heat exhaustion
 3. Heat stroke
- b. Compare and contrast the causes, signs, symptoms, and treatment of cold exposure.
 1. Hypothermia
 2. Frostbite

STANDARD 8

Students will explore specific sports injuries.

Objective 1: Recognize common injuries to the head and neck to include: concussion, cervical spine fractures, brachial plexus injuries, and nose bleeds.

- a. Review the anatomy of the head and neck.
 1. Bones (Frontal, Occipital, Parietal, Temporal, Mandible, Maxillae, Zygomatic, Nasal, Cervical Vertebrae)
 2. Muscles (Sternocleidomastoid, Trapezius)
 3. Structures (Brain, Intervertebral disks)
 4. Nerves (Cervical plexus, Brachial plexus)
- b. Identify the mechanism of injury.
- c. Identify the signs and symptoms of the injury.
- d. Indicate appropriate treatment for the injury.
- e. Describe injury prevention strategies.

Objective 2: Recognize common injuries to the upper extremity to include: clavicle fracture, impingement syndrome, rotator cuff injuries, glenohumeral dislocation, AC joint separation, epicondylitis, and interphalangeal dislocation.

- a. Review the anatomy of the upper extremity.
 1. Bones (Scapula, Clavicle, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges)
 2. Joints (Shoulder – sternoclavicular, acromioclavicular, glenohumeral, scapulothoracic; Elbow, Wrist, Metacarpal Phalangeal, Interphalangeal)
 3. Soft tissues (Subacromial bursa, AC ligament, Glenoid Labrum)
 4. Muscles (Deltoid, SITS, Biceps Brachii, Triceps Brachii)
- b. Identify the mechanism of injury.
- c. Identify the signs and symptoms of the injury.
- d. Indicate appropriate treatment for the injury.
- e. Describe injury prevention strategies.

Objective 3: Recognize common injuries to the lower extremity to include: collateral ligament sprains, cruciate ligament sprains, meniscal injury, patello-femoral injuries, ankle sprains, plantar fasciitis, turf toe, thigh contusions, quadriceps/hamstring strains, and medial tibial stress syndrome – “shin splints”.

- a. Review the anatomy of the lower extremity.
 1. Bones (Femur, Tibia, Fibula, Patella, Talus, Calcaneus, Metatarsals, Phalanges)
 2. Joints (Tibial Femoral, Patello Femoral, Talocrural, Subtalar)

3. Soft tissues (patellar tendon, ACL, MCL, PCL, LCL, lateral and medial meniscus. Anterior tibiofibular ligament, Anterior talofibular ligament, Deltoid ligament)
 4. Muscles (Quadriceps, Hamstrings, Peroneals, Tibialis Anterior, Tibialis Posterior, Gastrocnemius, Soleus, Achilles Tendon)
- b. Identify the mechanism of injury.
 - c. Identify the signs and symptoms of the injury.
 - d. Indicate appropriate treatment for the injury.
 - e. Describe injury prevention strategies.

Standard 9

Students will explain therapeutic modalities and rehabilitation techniques.

Objective 1: Explore therapeutic modalities.

- a. Identify the purpose of therapeutic modalities.
- b. Explain how to properly select the use of therapeutic modalities.
- c. Identify the Gate Control Theory as a principle of pain management and describe the physiological process of the theory.

Objective 2: Describe the physiologic effects, indications, contraindications, and application of:

- a. Cryotherapy
 1. Ice packs
 2. Ice massage
 3. Ice immersion
 4. Cold whirlpool
 5. Chemical coolant
 6. Describe the R.I.C.E. method for acute injuries
- b. Thermotherapy
 1. Heat packs
 2. Ultrasound
 3. Hot whirlpool
 4. Contrast baths
- c. Electrotherapy
- d. Massage

Objective 3: Discuss the components and goals of a rehabilitation program.

- a. Identify the general guidelines of a rehabilitation program.
 1. Individualize each program
 2. Be as aggressive as possible without causing harm
 3. Use a variety of equipment
 4. Common mistakes
 - a. Treat the cause not the symptoms
 - b. Not addressing the contra-lateral side
 - c. Postural defects, anatomical mal-alignment, and biomechanical imbalances are often neglected
 5. Appropriate goal setting
 6. Components of a rehabilitation program
- b. Phase I
 1. Body conditioning/maintain cardiovascular fitness throughout all phases
 2. Control swelling
 3. Control pain
 4. Increase range of motion
- c. Phase II
 1. Restore full range of motion
 2. Strength, endurance, speed, power in all muscle groups
 3. Begin skill patterns and proprioception
- d. Phase III

1. Functional and sport specific skills
2. Restore balance and proprioception
3. Return to sport
- e. Relate the different exercise principles to rehabilitation.
 1. SAID
 2. Overload

Standard 10

Students will describe principles of sports psychology

Objective 1: Identify the psychological implications of an injury to an athlete.

- a. Describe the five psychological phases an athlete experiences following an injury.
 1. Denial
 2. Anger
 3. Bargaining
 4. Depression
 5. Acceptance
- b. Compare and contrast athletes that deny pain and loss of function or view injury as a source of relief.

Objective 2: Identify effective psychological intervention skills.

- a. Describe the importance of goal setting.
 1. Performance goals
 2. Outcome goals
 3. SMART goals
- b. Examine different relaxation techniques and how they can help performance.
 1. Focused breathing
 2. Progressive muscle relaxation
- c. Analyze the use of visual imagery in sport.
 1. Aid in rehabilitation and healing
 2. Reduce anxiety
 3. Improve performance

Objective 3: Identify potential problems associated with overtraining.

- a. Compare and contrast staleness and burnout.
- b. Identify interventions to prevent or treat staleness or burnout.
 1. Remove from activity
 2. Time off
 3. Allow athlete to have more control
 4. Decreasing emotional and stressful demands
 5. Avoid repetition
 6. Sufficient attention to complaints and small injuries
 7. Supportive and caring environment