

# STRANDS AND STANDARDS

## EXERCISE SCIENCE/SPORTS MEDICINE



### 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.

<b>Intended Grade Level</b>	11-12
Units of Credit	1.0
Core Code	36.01.00.00.040
Concurrent Enrollment Core Code	36.01.00.13.040
Prerequisite	None
Skill Certification Test Number	701
Test Weight	1.0
<b>License Area of Concentration</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Exercise Science, Sport Medicine
Endorsement 2	N/A
Endorsement 3	N/A

## STRAND 1

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

### Standard 1

Identify Members of the Sports Medicine team.

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

### Standard 2

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

- Athletic Trainer (AT)
- Physical Therapist (PT)
- Physical Therapy Assistant (PTA)
- Occupational Therapist (OT)
- Occupational Therapy Assistant (OTA)
- Exercise Physiologist
- Orthopedic Surgeon
- Physician
  - DO
  - MD
- Physician Assistant (PA)
- Nurse Practitioner (NP)
- Biomechanist
- Prosthetist
- Orthotist
- Podiatrist
- Chiropractor (DC)
- Sports Psychologist
- Emergency Medicine
  - EMT
  - Paramedic
- Certified Strength & Conditioning Specialist/Personal Trainer (CSCS)
- Registered Dietician (RD)
- Massage Therapist (LMT)

### Standard 3

Explain legal issues and legal terminology.

- Discuss risk management in an athletic setting.
  - Collision
  - Contact
  - Non-contact
  - Surfaces
- Define legal terminology and discuss issues, including:
  - Assumption of risk

- Battery
- Failure to warn
- HIPAA
- Informed consent
- Liability
- Negligence
  - Duty of care
  - Breach of duty
  - Damage/injury occurred
  - Proximate cause
- Malpractice
- Commission
- Omission
- Standard of care
- Statute of limitations
- Good Samaritan law
- Discuss parameters of ethical conduct and associated issues, including:
  - Americans with Disabilities Act
  - Cheating
  - Drug testing
  - Fair play and sportsmanship
  - Performance enhancing drugs
  - Scope of practice
  - Title IX (gender equity in sports)
  - Winning at all costs
- Review preventative measures to reduce potential risks of litigation.
  - Medical History & Pre-participation Physical Examination (PPE)
  - Carry liability insurance
  - Continuing education
  - Appropriate documentation
  - Follow physician orders and recommendations
  - Have an emergency action plan (EAP)
  - Maintain adequate supervision
  - Maintain good rapport with the Sports Medicine Team

## STRAND 2

Students will describe principles of sports psychology.

### Standard 1

Identify the psychological implications of an injury to an athlete.

- Describe the five psychological stages an athlete experiences following an injury.
  - Denial
  - Anger
  - Bargaining
  - Depression
  - Acceptance

- Compare and contrast how some athletes may view pain.
  - Deny pain and loss of function.
  - Injury as a source of relief.

### **Standard 2**

Identify effective psychological intervention skills.

- Describe the importance of goal setting.
  - Performance goals
  - Outcome goals
  - SMART goals
- Examine different relaxation techniques and how they can help performance.
  - Focused breathing
  - Progressive muscle relaxation
  - Visual Imagery

### **Standard 3**

Identify potential problems associated with overtraining.

- Compare and contrast staleness and burnout.
- Identify interventions to prevent or treat staleness or burnout.
  - Remove from activity
  - Time off
  - Allow athlete to have more control
  - Decrease emotional and stressful demands
  - Avoid repetition
  - Sufficient attention to complaints and small injuries
  - Supportive and caring environment

### **Standard 4**

Discuss different sources of anxiety that athletes may deal with.

- Trauma induced
- Stress related
- Phobias that affect performance

### **Standard 5**

Discuss depression in athletes.

- Causes
- Resources (sources for professional help)
- Coping strategies

## **STRAND 3**

**Students will describe the injury and healing process, including basic injury assessment.**

### **Standard 1**

Discuss the inflammatory response and the healing process.

- Compare and contrast Acute and Chronic injuries.
- Discuss the purpose of inflammation.
- Categorize the stages of acute injury healing and explain the processes involved in each.

- Acute (Inflammation) Phase
  - Signs and symptoms of inflammation
    - Heat
    - Redness
    - Swelling
    - Pain
    - Loss of function
  - Time frame
  - Define vasodilation and explain why it occurs.
  - Define hypoxia and explain its role in secondary cell death.
  - Describe the R.I.C.E. method to treat acute injuries.
- Subacute (Repair and Regeneration) Phase
  - Time frame
  - Explain the role of fibroblasts and collagen in scar tissue formation.
- Remodeling (Maturation) Phase
  - Time frame
  - Define adhesions
  - Explain Wolff's Law

### Standard 2

Explain an injury assessment (HIPS).

- Identify the components included in obtaining an accurate history.
- Identify the components of an inspection.
- Describe the process of palpation.
- Describe the purposes of special tests.
  - Range of Motion
    - Passive
    - Active
    - Resistive
  - Stress Tests (structural integrity)
  - Neurological
  - Functional
- Discuss the decisions that can be made from a HIPS evaluation.

### Performance Skills

1. Write a SOAP note
2. Explain a HIPS assessment.

### Standard 3

Compare and contrast injury classifications.

- Describe first degree injuries.
- Describe second degree injuries.
- Describe third degree injuries.

### Standard 4

Compare and contrast common fractures.

- Compression
- Depressed

- Greenstick
- Comminuted
- Longitudinal
- Spiral
- Transverse

## Standard 5

### Vocabulary

- Anatomical Planes
  - Sagittal Plane/Midsagittal
  - Frontal/Coronal
  - Transverse/Horizontal
- Signs & Symptoms
  - Acute
  - Chronic
  - Constriction
  - Dilation
  - Ecchymosis
  - Edema
  - Effusion
  - Inflammation
  - Joint laxity

## STRAND 4

Students will explore specific sports injuries of the head and neck and apply athletic injury prevention principles.

### Standard 1

Review the anatomy of the head and neck.

- Bones
  - Frontal
  - Occipital
  - Parietal
  - Temporal
  - Mandible
  - Maxillae
  - Zygomatic
  - Nasal
  - Vertebrae
- Muscles
  - Sternocleidomastoid
  - Trapezius
- Structures
  - Brain
  - Intervertebral discs
- Nerves
  - Cervical Plexus
  - Brachial Plexus

**Standard 2**

## Head and neck injuries

- Recognize common injuries to the head and neck to include.
  - Concussion
  - Second impact syndrome
  - Subdural hematoma
  - Epidural hematoma
  - Cervical spine fracture
  - Brachial plexus injuries
  - Nose bleeds
- Identify the mechanism of each injury.
- Identify the signs and symptoms of each injury.
- Indicate appropriate treatment for each injury.
- Describe injury prevention strategies.

**Standard 3**

## Describe the basic principles and specialized equipment used in the prevention of athletic injuries.

- Recognize types and functions of protective equipment.
  - Helmet, facemask, ear guards
  - Mouth guards
  - Neck collars
  - Padding
  - Sports bras
  - Compression shorts/cup
- Discuss the legal ramifications of manufacturing, buying, and issuing equipment.
  - NOCSAE warning
  - Modification of equipment
  - Proper fit and selection
  - Use of defective or worn out equipment

**Standard 4**

## Vocabulary

- Amnesia
- Articulation
- Innervate
- Mechanism of Injury (MOI)
- Point tenderness
- Range of Motion (ROM)-Active, Passive, Resistive
- Referred Pain

**STRAND 5****Students will explore various aspects of sports nutrition.****Standard 1**

Describe the basic components (kcal/gram, functions, energy vs. nutrients, healthy diet guidelines) of nutrition and the sources of the following nutrients.

- Carbohydrates
- Proteins

- Fats
- Vitamins
- Minerals
- Water

### Standard 2

Examine the importance of fluid replacement and hydration.

- Examine the importance of water and its role in the body.
- Explain the correct process of hydration during athletic activity.
  - Identify the dangers of inappropriate hydration techniques.
    - Hyponatremia
    - Timing/Frequency
  - Identify the dangers of dehydration.
- Compare and contrast advantages and disadvantages of sports drinks.
  - Identify the role of sports drinks in hydration.
  - Discuss the importance of the correct chemical make-up of sports drinks.

### Standard 3

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

- Identify the recommended nutrients included in pre and post event meals.
- Identify foods that are easily digested.
- Identify foods that should be avoided.
- Identify when pre and post event meals should be eaten.
- Discuss the concept of carbohydrate loading and discuss the benefits.

## STRAND 6

**Students will explore the fundamentals of body composition and diseases and disorders related to body issues.**

### Standard 1

Describe basic body composition.

- Define body composition.
- Compare and contrast the most common methods for analyzing body composition.
  - Bod Pod
  - Skin-fold calipers
  - Bio-Impedance Analysis (BIA)
  - Hydrostatic weighing
  - Emerging technologies (ultrasound, etc.)
- Describe the parameters of safe weight loss and weight gain.

### Standard 2

Recognize common conditions and disorders associated with nutrition.

- Explore the effects of generalized disordered eating.
- Identify signs, symptoms, and effects of Anorexia Nervosa.
- Identify signs, symptoms, and effects of Bulimia Nervosa.
- Identify signs, symptoms, and effects of Muscle Dysmorphia.
- Identify signs, symptoms, and effects of the Female Athlete Triad (three components).

## STRAND 7

Students will explore specific sports injuries of the lower extremities and apply athletic injury prevention principles.

### Standard 1

Review the anatomy of the lower extremities.

- Bones
  - Femur
  - Tibia
  - Fibula
  - Patella
  - Talus
  - Calcaneus
  - Metatarsals
  - Phalanges
- Joints
  - Tibiofemoral
  - Patellofemoral
  - Talocrural
  - Subtalar
  - Midfoot
  - MP
  - PIP/DIP
- Soft Tissues
  - Patellar Tendon
  - Anterior Cruciate Ligament (ACL)
  - Posterior Cruciate Ligament (PCL)
  - Medial Collateral Ligament (MCL)
  - Lateral Collateral Ligament (LCL)
  - Lateral and Medial Meniscus
  - Achilles Tendon
  - Anterior Talofibular ligament (ATF)
  - Deltoid ligament
- Muscles
  - Quadriceps
  - Hamstrings
  - Peroneal
  - Tibialis Anterior
  - Tibialis Posterior
  - Gastrocnemius
  - Soleus

### Standard 2

Lower extremity injuries

- Recognize common injuries to the lower extremity to include.
  - Cruciate/Collateral Ligament sprains
  - Meniscal injury
  - Patellofemoral injuries
  - Ankle sprains

- Plantar Fasciitis
- Turf toe
- Thigh contusions
- Quadriceps/Hamstring strains
- Medial Tibial Stress Syndrome (MTSS)
- Identify the mechanism of each injury.
- Identify the signs and symptoms of each injury.
- Indicate appropriate treatment for each injury.
- Describe injury prevention strategies.
  - Shin Guards
  - Shoes
  - Other sport specific protection devices

### Standard 3

Demonstrate theory and principles of prophylactic taping.

- Analyze the basic principles of prophylactic taping.
- Identify the necessary supplies and their purpose for prophylactic taping.
  - Athletic tape (various sizes)
  - Prewrap
  - Heel and lace pad
  - Adhesive spray
  - Shark/Scissors
- Analyze the basic principles of proper tape removal.
- Explain the terminology associated with prophylactic taping procedures.
  - Anchor
  - Stirrup
  - Horseshoe
  - Spica
  - Heel-lock
  - Checkrein/Fan

### Performance Skill

Competently tape an ankle using the standard prophylactic taping method.

Competently tape an arch using the standard prophylactic taping method. (Optional additional skill)

### Standard 4

Identify principles of protective bracing.

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

### Standard 5

Vocabulary

- General Terms
  - Atrophy
  - Bursa
  - Cartilage
  - Crepitus
  - Ligament
  - Tendon

- Valgus/Varus
- Anatomical Positions and Directions
  - Superior/Inferior
  - Anterior/Posterior
  - Medial/Lateral
  - Proximal/Distal
  - Superficial/Deep
  - Ventral/Dorsal
  - Prone/Supine
  - Unilateral/Bilateral/Contralateral
- Movements of the Foot and Ankle
  - Inversion/Eversion
  - Dorsiflexion/Plantarflexion

## STRAND 8

Students will examine performance enhancement philosophies.

### Standard 1

Define terms associated with performance enhancements.

- Cardiovascular endurance
- Muscular endurance
- Power
- Speed
- Strength

### Standard 2

Discuss general conditioning principles.

- Adaptation
- Overload
- Specificity
- Reversibility
- Periodization

### Standard 3

Examine the role the cardiovascular/respiratory systems have on fitness/athletic performance.

- Identify and describe the structures and functions of the cardiovascular/respiratory systems and their interrelationship.
- Heart
  - 4 chambers
  - 4 valves
  - 4 blood vessels
  - Lungs - Oxygen exchange from alveoli to capillaries
- Identify vital signs related to the cardiovascular/respiratory system.
  - Describe and accurately measure blood pressure (systolic/diastolic).
  - Describe and accurately measure respiratory rate.
  - Describe and accurately measure pulse rate.
  - Describe lung volumes.
    - Tidal volume

- Vital capacity
- Describe the importance of cardiac output, stroke volume, and heart rate during exercise.
- Examine different types of tests used to quantify cardiovascular fitness.
  - VO<sub>2</sub>max
  - Harvard step test
  - 12-minute run test
- Describe the effects exercise has on the cardiovascular/respiratory systems.
  - Immediate effects of exercise
    - Heart rate
    - Ventilation
  - Long term effects of exercise
    - Heart rate
    - Stroke volume
    - Cardiac output
- Compare and contrast aerobic/anaerobic training.
- Examine the importance of a warm up/cool down in a training program.
- Examine different cardiovascular training methods.
  - Interval
  - Fartlek
  - Circuit
  - Continuous
- Apply general conditioning principles to improve cardiovascular fitness.
  - Rate of perceived exertion (BORG scale)
  - Target heart rate

#### **Standard 4**

Examine the effects of the environment on training and performance.

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

## **STRAND 9**

**Students will examine strength training principles, flexibility, and ergogenic aids.**

#### **Standard 1**

Examine the role strength training has on fitness/athletic performance.

- Identify and describe the sliding filament model.
- Sarcomere
  - Actin
  - Myosin
- Compare and contrast the difference between slow twitch and fast twitch muscle fibers.
  - Slow twitch athletic activities
  - Fast twitch athletic activities
- Compare and contrast different types of movements related to strength training.
  - Isometric/Isotonic/Isokinetic
  - Eccentric/Concentric
  - Closed chain/Open chain
  - Plyometrics

- Identify methods of resistance training.
- Apply general conditioning principles to improve strength.
  - Speed
  - Muscular endurance
  - Power
  - Periodization

### Standard 2

Examine the importance of flexibility in fitness/athletic performance.

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

### Performance Skill

Demonstrate the proper techniques of static stretching for ALL major muscle groups.

### Standard 3

Compare and contrast the physiological and psychological effects of ergogenic aids.

- Define ergogenic aid.
- Recognize the effects and possible dangers of common ergogenic aids.
  - Stimulants (including caffeine)
  - Narcotics
  - Anabolic steroids
  - Beta blockers
  - Diuretics
  - Human growth hormone
  - Blood doping products
    - Blood transfusions
    - Erythropoietin (EPO)
  - Anesthetics
  - Corticosteroids
  - Creatine
- Discuss the dangers of energy drinks and their effects on the body.

## STRAND 10

Students will explore specific sports injuries of the upper extremities and apply athletic injury prevention principles.

### Standard 1

Review the anatomy of the upper extremity.

- Bones
  - Scapula
  - Clavicle
  - Humerus
  - Radius
  - Ulna
  - Carpals
  - Metacarpals
  - Phalanges
- Joints
  - Shoulder
    - Sternoclavicular (SC)
    - Acromioclavicular (AC)
    - Glenohumeral
    - Scapulothoracic
  - Elbow
  - Wrist
  - Metacarpal-phalangeal
  - Interphalangeal
- Soft tissues
  - Sub-acromial bursa
  - AC ligament
  - Glenoid labrum
- Muscles
  - Deltoid
  - Pectoralis Major
  - Latissimus Dorsi
  - Rotator Cuff (Subscapularis, Infraspinatus, Supraspinatus, Teres minor (SITS))
  - Biceps brachii
  - Triceps brachii

### Standard 2

Recognize common injuries to the upper extremity.

- Upper extremity injuries
  - Clavicle fracture
  - Impingement syndrome
  - Rotator cuff injuries
  - Glenohumeral dislocation
  - AC joint separation
  - Epicondylitis
    - Lateral (Tennis elbow)
    - Medial (Little leaguer's elbow)

- Interphalangeal dislocation
- Identify the mechanism of each injury.
- Identify the signs and symptoms of each injury.
- Indicate the appropriate treatment for each injury.
- Describe injury prevention strategies.

### Performance Skill

Competently tape a thumb using the standard prophylactic taping method.

Competently tape a wrist using the standard prophylactic taping method. (Optional additional skill)

### Standard 3

Vocabulary

- Movements
  - Flexion/Extension/Hyperextension
  - Abduction/Adduction
  - Pronation/Supination
  - Protraction/Retraction
  - Elevation/Depression
  - Rotation
    - Internal rotation
    - External rotation
  - Circumduction
  - Lateral flexion
- Movements of the Wrist & Thumb
  - Radial/Ulnar deviation
  - Opposition

## STRAND 11

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

### Standard 1

Identify proper personal protective equipment (PPE)/body substance isolation (BSI) precautions.

### Standard 2

Identify soft tissue injuries and skin conditions.

- Differentiate signs, symptoms, and treatment for:
  - Abrasions
  - Avulsions
  - Bites
  - Blisters
  - Contusions
  - Lacerations
  - Stings
- Differentiate signs, symptoms, and treatment for
  - Ring worm
  - Jock itch
  - Athlete's foot
  - Impetigo

- MRSA
- Warts
- Eczema

### Standard 3

Recognize abdominal injuries, bleeding, and shock.

- Discuss external bleeding.
- Demonstrate proper procedures to control bleeding.
  - Apply direct pressure with sterile gauze pad.
  - Apply a pressure dressing.
  - Check circulation.
- Identify signs, symptoms, and treatment of internal bleeding.
- Identify signs, symptoms, and treatment of abdominal injuries.
  - Ruptured spleen
  - Appendicitis
  - Hernia
- Identify signs, symptoms and treatment for shock.

### Standard 4

Discuss immobilization techniques.

- Identify fracture signs and symptoms.
- Explain the steps to immobilization.
  - Splint in the position found.
  - Immobilize to the joint above and the joint below.
  - Check circulation distal to the injury.
- Explain head/neck stabilization.
  - Maintain stabilization in the position found.
  - Monitor ABC's

### Performance Skill

Demonstrate crutch fitting to any size individual.

Stabilize head/neck in position found. (Optional additional skill)

### Standard 5

Recognize and provide treatment for environmental conditions.

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

### Standard 6

Describe the treatment for medical conditions.

- Seizures
- Fainting
- Diabetes
- Anaphylactic shock

- Asthma
- Exertional sickling
- Sudden cardiac arrest

### Standard 7

#### Vocabulary

- General Vocabulary Terms
  - Cyanosis
  - Diagnosis
  - Incision
  - Palpation
  - Prognosis
  - Reduction
  - Shock
- Injuries
  - Bursitis
  - Dislocation
  - Subluxation
  - Fracture
  - Hematoma
  - Separation
  - Sprain
  - Strain

## STRAND 12

Students will explain therapeutic modalities and rehabilitation techniques.

### Standard 1

Explore therapeutic modalities.

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

### Standard 2

Describe the physiological effects, indications, contraindications, and application of the following:

- Cryotherapy
  - Ice Packs
  - Ice massage
  - Ice immersion
  - Cold whirlpool
  - Chemical coolant
  - Review the R.I.C.E. method
- Thermotherapy
  - Heat packs
  - Ultrasound
  - Hot whirlpool
- Electrotherapy

- Manual Therapy
  - Massage
  - Cupping
  - Scraping techniques

### Performance Skills

1. Prepare an ice bag/pack.
2. Apply a compression wrap to an ankle.
3. Apply a compression wrap to a knee.

### Standard 3

Discuss the components and goals of a rehabilitation program.

- Identify the general guidelines of a rehabilitation program.
  - Individualize each program
  - Be as aggressive as possible without causing harm
  - Use a variety of equipment
  - Common mistakes
    - Treat the cause not the symptoms
    - Not addressing the contralateral side
    - Postural defects, anatomical malalignment, and biomechanical imbalances
  - Appropriate goal setting.
  - Components of a rehabilitation program.
- Phase I
  - Body conditioning/maintain cardiovascular fitness throughout all phases
  - Control swelling
  - Control pain
  - Increase range of motion
- Phase II
  - Restore full range of motion
  - Strength, endurance, speed, power in all muscle groups
  - Begin skill patterns and proprioception
- Phase III
  - Functional and sport specific skills
  - Restore balance and proprioception
  - Return to sport
- Relate the different exercise principles to rehabilitation.
  - Specificity(SAID)
  - Overload

### Standard 4

Vocabulary

- Analgesic
- Contraindicate
- Cryotherapy
- Hydrotherapy
- Indicate
- Modality
- Thermotherapy
- Vasoconstrictor

- Vasodilator

**Workplace Skills**

- Communication
- Problem Solving
- Teamwork
- Critical Thinking
- Dependability
- Accountability
- Legal Requirements/expectations

**Skill Certification Test Points by Strand**

Test Name	Test #	Number of Test Points by Strand												Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10	11	12		