STRANDS AND STANDARDS

MEDICAL FORENSICS

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Course Description

This year-long course is designed to create an awareness of the branch of health science relating to medical forensics. This course focuses on introductory skills and assessment in order to develop the ability to identify, analyze, and process logically using deductive reasoning and problem solving. Medical forensics involves many aspects of health science instruction including laboratory skills and safety, microscopy, toxicology, measurement, physical evidence identification, pathology, anthropology, entomology, psychology, blood spatter analysis, and career exploration.

Intended Grade Level	11-12
Units of Credit	1.0
Core Code	36.01.00.00.085
Concurrent Enrollment Core Code	36.01.00.13.085
Prerequisite	Biology
Skill Certification Test Number	730
Test Weight	10.0
License Type	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Medical Forensics
Endorsement 2	
Endorsement 3	

STRAND 1

Introduction to Medical Forensics-Students will explore the fundamental aspects of Medical Forensics.

Standard 1

Detail the history and development of medical forensics.

- Create a historical timeline.
- Explore a variety of careers associated with medical forensics professions.
    - Crime laboratory analyst
    - Clinical laboratory technician
    - Microbiologist
    - Fingerprint analyst
    - Criminalist
    - Crime scene photographer
    - Phlebotomist
    - Forensic serology DNA criminalist
    - Serology technician
    - Forensic psychologist
    - Mental health counselor
    - Toxicologist
    - Biochemist
    - Pharmacologist
    - Geneticist
    - Medical examiner

Standard 2

Discuss the organization of the crime laboratory and detail the functions it serves.

- Discuss the federal programs established in the United States to investigate crimes.
    - ATF
    - FBI
    - Post Office
    - DEA
- Describe the organization of the Utah Crime Lab.
- Compare and contrast the Utah Crime Lab with a crime lab from another state and an international crime lab.

Standard 3

Describe the importance of physical evidence and observation.

- List the types of evidence.
    - Eyewitness
    - Class evidence
    - Physical evidence
        - Trace

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        - Circumstantial
        - Individual
        - Class
    - Discuss how evidence is used to convince a jury of guilt.
    - Review and practice the steps of becoming an accurate observer.
        - Observe systematically
        - Turn off filters
        - Interpret information later
        - Documentation
            - Written
            - Photographs

STRAND 2

Fundamental Laboratory Skills-Students will explore essential laboratory safety skills and fundamental skills related to microscopy and measurement.

Standard 1

Demonstrate appropriate use of personal protective devices.

- Describe how personal protective devices protect the evidence and the lab worker.
- Demonstrate how to properly use personal protective devices (e.g., lab coats, gloves, safety glasses.
- Demonstrate safe removal of gloves.

Standard 2

Exhibit appropriate behavior in the lab.

- Explain the dangers of evidence contamination through food, drink, cosmetics, lotion, eye drops, and contact lenses.
- Follow proper disposal and clean-up procedures with respect to chemicals and laboratory equipment.
- Demonstrate proper hand washing technique.

Standard 3

Use laboratory equipment correctly and safely.

- Demonstrate the proper use of equipment.
    - Micropipette
    - Centrifuge
    - Spectrophotometer
    - Electrophoresis apparatus-DNA
    - Thermocycler
    - Microscope
    - Balance
    - Water bath
    - Vernier calipers

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    - Glassware (metric units)
    - Rulers/Measuring tapes
- Demonstrate proper use, handling, and components of a compound microscope and a stereoscope.
- Demonstrate the ability to create a wet mount slide.

Standard 4

Follow laboratory procedures.

- Understand the purpose of individual steps within a protocol.
- Perform the steps of laboratory protocols accurately and in sequence.

Standard 5

Comply with policies and requirements for maintaining a lab manual.

- Follow standard operating procedures for maintaining a lab manual.
- Document laboratory work following the steps of the Scientific Method.
    - Objectives
    - Material
    - Procedures
    - Data/Results
    - Conclusion

Standard 6

Demonstrate proper handling of chemicals.

- Communicate the rationale for laboratory labeling procedures.
- Recognize and comply with the labeling of chemicals used in a laboratory setting for safe handling and storage (flammability, corrosiveness, biohazards, toxicity, etc.).
- Reference and interpret the guidelines in Safety Data Sheets (SDS).

Strand 2 Performance Evaluation included below:

STRAND 3

Medical Forensics Investigation-Students will describe techniques used to process a homicide crime scene and preserve the evidentiary value of the scene.

Standard 1

Describe how various medical forensics professionals process a crime scene.

- Responding officer
- Crime Scene Investigator
- Crime Scene Photographer
- Medical Examiner

Standard 2

Demonstrate or describe proper procedures of evidence collection.

- Trace (demonstrate)

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- Biological (describe)
- Drugs, Plants, and Drug Paraphernalia (Describe)
- Weapons (describe)
- Fingerprint (demonstrate)

Standard 3

Identify how a crime scene and evidence may be compromised.

- Contamination (family, law enforcement, crime scene workers, etc.)
- Chain of custody (evidence lost, etc.)
- Environmental conditions (temperature, moisture, etc.)
- Preservation of the crime scene (value of evidence, etc.)
- Processing at the lab

Strand 3 Performance Evaluation included below:

STRAND 4

Students will identify and analyze trace evidence, emphasizing hair and fiber.

Standard 1

Examine trace evidence using a microscope, chromatography, and other techniques.

- Define and list examples of trace evidence.
- Collect and analyze various types of trace evidence (dust, pollen, fiberglass, etc.)
- Define and identify a variety of microbes.
- Use a compound microscope to identify microbes.

Standard 2

Examine and analyze the forensic aspects of hair.

- Describe the microscopic structure of hair.
    - Shaft
        - Cortex
        - Cuticle
        - Medulla
    - Root
    - Follicle
- Describe the location of nuclear and mitochondrial DNA associated with hair.
    - Shaft
    - Root
- Describe the hair growth cycle and how it relates to trace evidence.
    - Anagen, catagen, telogen
    - Chemical absorption
- Describe how to differentiate between animal hair and human hair.

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Standard 3

Examine and analyze the forensic aspects of fibers by using physical (microscopic) and chemical (burn, acid, base, acetone) testing methods.

- Natural fibers
    - Wool
    - Silk
    - Cotton
    - Cashmere
    - Hemp
    - Etc.
- Synthetic
    - Polyester
    - Spandex
    - Acrylic
    - Nylon
    - Etc.

STRAND 5

Fingerprint Identification-Students will explore fingerprint identification.

Standard 1

Describe fingerprint classification.

- Describe the 3 fundamental principles of fingerprinting.
    - First degree
    - Second degree
    - Third degree
- Identify the degrees of fingerprinting
    - First degree
    - Second degree
        - Bifurcation
        - Ridge ending
        - Short ridge
        - Island/Dot
        - Double bifurcation
        - Crossover
        - Enclosure
    - Third degree

Standard 2

Identify and classify fingerprint and ridge patterns.

- Classify fingerprints into 3 basic patterns.
    - Loops
        - Right

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        - Left
    - Whorls
        - Double
        - Plain
        - Central
        - Accidental
    - Arches
        - Tented
        - Plain
- Identify individualization of fingerprints.
    - Ridge characteristics
    - Ridge count
- Describe the IAFIS System of fingerprint identification.

Standard 3

Compare and contrast latent, plastic, and visible fingerprints.

- Develop latent fingerprints using dusting, staining, and chemical fuming.
- Develop a plastic fingerprint using a mold (wax, soap, putty, etc.)
- Create and document visible fingerprints using digital photography.

Strand 5 Performance Evaluation included below.

STRAND 6

Students will investigate the characteristics of blood, blood testing, and bloodstain analysis.

Standard 1

Identify the components and chemical properties of blood.

- List the components of blood.
    - Plasma
    - Erythrocytes (red blood cells)
    - Leukocytes (white blood cells)
    - Thrombocytes (platelets)
- Identify the antigens and antibodies that determine ABO blood types and the Rh factor.

Standard 2

Determine genetic probabilities using blood types.

- Use a Punnett Square to determine blood type probabilities.
- Apply the use of a Punnett Square to solve paternity questions.

Standard 3

Examine and analyze blood spatter.

- Illustrate size, shape, and directionality of blood spatter in a laboratory experiment.

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- Compare and contrast low, medium, and high velocity blood spatter.
- Examine different types of blood spatter patterns.
    - Drip
    - Castoff
    - Transfer
    - Swipe
    - Wipe
    - Arterial
    - Expirated
    - Misting
    - Void

Standard 4

Describe proper procedures for blood stain evidence collection, presumptive testing (Kastle-Meyer), and preservation.

- Describe how to collect a wet stain and a dry stain.
- Demonstrate how to collect a large object in reference to blood evidence collection (i.e. sheets, blankets, clothing, etc.)
- Using residual blood from a mammal, perform and explain a presumptive blood test.
    - i.e. Absorption pads from ground beef

Strand 6 Performance Evaluation included below.

STRAND 7

Students will investigate various aspects of death.

Standard 1

Describe correct anatomical position and the role it plays in death investigation.

- Describe anatomical position.
- Apply directional terms related to autopsy.
    - Superior
    - Inferior
    - Anterior
    - Posterior
    - Dorsal
    - Ventral
    - Medial
    - Lateral
    - Proximal
    - Distal
    - Deep Superficial
    - Supine
    - Prone

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Standard 2

Locate the body cavities and body regions and identify the major organs within each.

- Dorsal cavity
  - Cranial
  - Spinal
- Ventral cavity
  - Thoracic
  - Abdominal
  - Pelvic
- Body regions
  - Right hypochondriac
  - Left hypochondriac
  - Epigastric
  - Right lumbar
  - Left lumbar
  - Umbilical
  - Right inguinal
  - Left inguinal
  - Hypogastric

Standard 3

Identify the following organs and their location.

- Lungs
- Heart
- Diaphragm
- Esophagus
- Trachea
- Stomach
- Spleen
- Pancreas
- Liver
- Gallbladder
- Small Intestine
- Large intestine
- Kidney
- Bladder

Standard 4

Compare and contrast the manner and method of death.

- Define and list manners of death.
- Define and list methods/causes of death.
- Define and list mechanisms of death.

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Standard 5

Identify the steps of an autopsy procedure and discuss the role an autopsy report may play in a death investigation.

- List the steps of an external examination.
- Describe the proper technique to perform a Y-shaped incision
- List the steps of an internal examination.

Standard 6

Identify the stages of decomposition to determine the approximate time of death.

- Define taphonomy and describe the stages of decomposition.
    - Fresh
    - Putrefaction
    - Black putrefaction
    - Butyric
    - Dry
- Compare and contrast the following:
    - Algor mortis
    - Rigor mortis
    - Livor mortis
- Identify common insects associated with decomposition (i.e. blow fly, carrion beetle, etc.) and diagram their life cycles.
    - Egg
    - Larva
    - Pupa
    - Adult
- Identify various environmental factors related to time of death (temperature, humidity, cause of death, etc.)

Strand 7 Performance Evaluation included below.

STRAND 8

Students will explore aspects of the criminal mind.

Standard 1

Locate and identify the major organs of the nervous system.

- Brain
    - Cerebral cortex
    - Cerebellum
- Spinal cord

Standard 2

Identify and describe offender profiling procedures.

- Profiling input

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- Decision process models
- Crime assessment
- Criminal profile
- Investigation
- Apprehension

Standard 3

Identify psychological testing processes and procedures and other factors that affect the criminal mind.

- Describe the tests used to determine the cognitive and personality types of offenders.
- Discuss the problems with psychometric tests.
- Describe brain abnormalities, genetics, and environmental factors related to the criminal mind.
- Describe the physiological functions measured by a polygraph machine.

Standard 4

Compare and contrast neurobiological brain abnormalities and mental conditions related to abnormal psychology and the criminal brain and technical instrumentation used to diagnose these abnormalities.

- Describe brain abnormalities, genetics, and environmental factors related to the criminal mind.

Standard 5

Explore the psychological aspects of serial killers and mass murderers.

- Define serial killer.
- Define mass murderer.
- Explore the motives of a serial killer.
- Compare and contrast the types of serial killers.
- Explore the motives of a mass murder.

STRAND 9

Students will explore characteristics of physical evidence and remains.

Standard 1

Identify the basic bones of the skeleton and distinguish the differences between long and short bones.

- Cranium
- Vertebrae
- Sternum
- Xiphoid process
- Ribs
- Hyoid
- Humerus

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- Radius
- Ulna
- Carpals
- Metacarpals
- Phalanges
- Pelvis
- Femur
- Patella
- Tibia
- Fibula
- Tarsals
- Metatarsals
- Phalanges

Standard 2

Use skeletal remains to determine the physical characteristics of an individual.

- Determine the sex of an individual based on skull, jaw, brow ridge, pelvis, and femur.
- Determine the ancestry of an individual.
- Estimate the age of an individual.
- Estimate the height, build, and handedness of an individual.

Standard 3

Identify injuries, bone diseases, and possible causes/methods of death using bone characteristics.

- Compare and contrast pre and postmortem bone injuries (i.e. fractures).
- Identify bone patterns indicating disease (i.e. arthritis).
- Identify bone markings that could indicate cause of death (i.e. stab wound, bullet hole, blunt force trauma, etc.)

Standard 4

Describe how teeth are used in forensic identification.

- Name and number deciduous (baby) and permanent teeth.
- Employ dentition patterns as a means for bite mark identification.
- Describe the use of forensic dentistry in regard to mass disasters and body identification.

Strand 9 Performance Evaluation included below.

STRAND 10

Students will develop an understanding of the adverse effects of drugs and be acquainted with the laboratory investigation of the most common poisonings.

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Standard 1

Identify the five schedules of drug types and classify according to the effects that they have on the body.

- Describe the five schedules of drug types.
  - Schedules 1-5
- Classify the Categories of drugs based on the physiological effects on the body and the chemical composition.
  - Stimulants (i.e. Amphetamines, Cocaine, Crack, Methamphetamines, Adderall, other mental disorder medications)
  - Depressants (i.e. Alcohol, Sedatives, Xanax, Marijuana, All narcotics, other mental disorder medication)
  - Narcotics/Opioids (i.e. Heroin, Codeine, Methadone, Oxycodone)
  - Hallucinogens (i.e. Ecstasy (MDMA), Bath salts, Mushrooms, GHB, other "date rape" drugs)

Standard 2

Describe how individual body systems are affected by drug intake.

- Integumentary
- Skeletal
- Muscular
- Nervous
- Cardiovascular
- Respiratory
- Endocrine
- Digestive
- Urinary
- Reproductive

Standard 3

Identify signs and symptoms of an overdose.

- Stimulants
- Depressants
- Narcotics/Opioids
- Hallucinogens

Standard 4

Describe current field and laboratory procedures used for measuring the concentration of alcohol in the bloodstream.

- Describe techniques used to measure the blood alcohol content (BAC).
  - Through blood
  - Through the breath
- Anabolic steroids
- Depressants (including alcohol)

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- Bacterial toxins
  - Botulism
  - Tetanus
- Heavy metals and pesticides
  - Lead
  - Mercury
  - Arsenic
  - Cyanide
  - Strychnine

Standard 5

Discuss other chemical and biological agents that have high mortality rates with exposure.

- Bacterial toxins
  - Botulism (clostridium botulinum)
  - Tetanus (clostridium tetani) lockjaw
- Bioterrorism
  - Ricin (castor beans)
  - Anthrax (Bacillus anthracis)

Standard 6

Compare and contrast methods used to collect and package drug evidence.

- Identify procedures used to collect and package plant substances.
- Identify procedures used to collect and package liquids.
- Identify procedures used to collect and package biohazards.

STRAND 11

Students will investigate the importance of DNA evidence.

Standard 1

Identify the structure and function of a DNA molecule.

- Describe the structure of DNA.
- Describe the function of DNA.
- Compare and contrast nuclear DNA and mitochondrial DNA

Standard 2

Describe advancements in technology used to obtain a DNA fingerprint.

- Describe the purpose of PCR.
- Define RFLP and discuss how it relates to forensic identification.
- Define STR and discuss how it relates to forensic identification.
- Describe the CODIS System of DNA identification.
- Processing at the lab.

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Performance Skills

STRAND 2

Maintain an accurate lab manual.

- Follow standard operating procedures for maintaining a lab manual.
- Document laboratory work following the steps of the Scientific Method.

STRAND 3

Collect and properly label evidence.

STRAND 5

Develop a latent fingerprint and identify 10 ridge characteristics.

STRAND 6

Classify blood spatter by velocity.

- High
- Medium
- Low

STRAND 7

Identify the steps of an autopsy procedure by animal dissection.

- Steps of an external examination
- Proper Y-shaped incision technique
- Steps of an internal examination

STRAND 9

Identify the sex of an individual based on skeletal markers.

- Skull
- Jaw
- Brow ridge
- Pelvis
- Femur

Match a bite mark from a victim to the perpetrator.

Workplace Skills

- Communication
- Problem solving
- Teamwork
- Critical Thinking
- Dependability
- Accountability
- Legal requirements/expectations

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Skill Certificate Test Points by Strand

Example table below. Refer to instructions for specifics.

Test Name	Test #	Number of Test Points by Standard											Total Points	Total Question
		1	2	3	4	5	6	7	8	9	10	11		
Medical Forensics	730	3	2	3	7	10	10	11	5	8	4	5	68	65

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