Medical Forensics
Utah CTE

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
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

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 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)
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 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

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
Synthetic
Polyester
Spandex
Acrylic
Nylon

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
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 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.

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 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

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

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 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

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

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 substances in the bloodstream

Describe techniques used to measure the blood alcohol content (BAC).

Through blood
Through the breath
Anabolic steroids
Depressants (including alcohol)
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.

pp. 6-13

pp. 767-774
pp. 67, 70
Related pp. 767-774
Related pp. 767-774
p. 590, p. 613
pp. 767-768
p. 53
Related pp. 767-774
pp. 326-327
pp. 326-327
p. 771
Related pp. 767-774
p. 772
p. 767
p. 772
p. 376, Related pp. 767-774
p. 770

p. 639
p. 14

p. 191
Related pp. 15-18

Related pp. 15-18

p. 26
pp. 89-90

p. 26
pp. 61-64
p. 67
p. 91
pp. 89-90
p. 515

p. 51
Related pp. 51-54
Related pp. 51-54
pp. 51-52
pp. 51-52
pp. 53-54

pp. 71-72, p. 397, Basic Laboratory Exercises p. v

p. 397
pp. 71-72

p. 67, Basic Laboratory Exercises p. v

Basic Laboratory Exercises p. v, p. vii
Basic Laboratory Exercises p. v

p. 322, p. 529, Basic Laboratory Exercises p. v-vi
Related Basic Laboratory Exercises p. 50, p. 55

p. 650
pp. 378-379

pp. 11-12
pp. 162-163

Basic Laboratory Exercises p. 93

Basic Laboratory Exercises p. vii
p. 438

pp. 305-306, Basic Laboratory Exercises pp. 35-38
p. 322, Basic Laboratory Exercises p. 35

Basic Laboratory Exercises p. 23

Basic Laboratory Exercises p. 26

p. 26
p. 26
p. 26
p. 26
p. 26
p. 26

p. 65

p. 65

pp. 48-49
pp. 49-50
pp. 53-56
p. 52, p. 62

pp. 63-64
pp. 65-66
p. 217
pp. 653-654

pp. 602-608

pp. 49-50
p. 68
p. 50
pp. 61-63
pp. 62-63

p. 496

pp. 519-522
p. 398
pp. 305-306, Basic Laboratory Exercises pp. 35-38

pp. 456-460
p. 456
p. 456, p. 458
p. 456
p. 456, p. 459
p. 460
p. 456, p. 460

p. 465
p. 465
p. 465

p. 459
pp. 459-460
pp. 460-461

pp. 459-461

p. 468

p. 322, p. 468
p. 322
p. 322, p. 468
p. 468
p. 203
pp. 469-472
p. 322, p. 469
p. 469
p. 469. p. 472
p. 469

pp. 590-595
pp. 590-591
pp. 592-593
pp. 593-595
pp. 590-595
pp. 590-592
pp. 592-593
p. 590, p. 598
p. 598
p. 592
p. 590
p. 590, p. 598
Related pp. 590-595
p. 590
pp. 593-595

Basic Laboratory Exercises pp. 24-25
p. 593
Related Basic Laboratory Exercises pp. 24-25
Related Basic Laboratory Exercises pp. 24-25
p. 594
p. 594
p. 594
p. 594
p. 594
p. 595
p. 595

p. 595
Basic Laboratory Exercises pp. 24-25
p. 590
Related pp. 590-595
pp. 597-600

pp. 602-608
pp. 602
pp. 612-613

p. 327
p. 327
p. 327
p. 327
p. 327

pp. 327-329

p. 343
pp. 343-344

pp. 421-424

p. 422
Basic Laboratory Exercises pp. 55-56
p. 434
pp. 425-426
pp. 430-431
Related pp. 430-431
pp. 430-431
p. 428
p. 428

p. 429

Basic Laboratory Exercises pp. 60-63

Related Basic Laboratory Exercises pp. 60-63

Basic Laboratory Exercises pp. 60-63
Basic Laboratory Exercises pp. 60-63

Basic Laboratory Exercises p. 87
Basic Laboratory Exercises p. 88
Basic Laboratory Exercises p. 87
Basic Laboratory Exercises p. 87
Related Basic Laboratory Exercises pp. 87-88
Related Basic Laboratory Exercises pp. 87-88
Basic Laboratory Exercises p. 88
Basic Laboratory Exercises p. 88
Basic Laboratory Exercises p. 88
Basic Laboratory Exercises p. 88
Related Basic Laboratory Exercises pp. 87-88
Basic Laboratory Exercises p. 8, Related Basic Laboratory Exercises pp. 87-88
Related Basic Laboratory Exercises pp. 87-88

pp. 116-117

p. 117
p. 130

pp. 257-258
pp. 256-257

p. 257
p. 257
p. 257
p. 334

pp. 116-117
p. 117
p. 206

p. 211

pp. 123-125
pp. 120-125
pp. 123-125

pp. 115-116
p. 116
pp. 116-117

Basic Laboratory Exercises pp. 80-84
p. 128
p. 128
Related p. 128
Related p. 128
Related p. 128

p. 126

p. 127
p. 126

Basic Laboratory Exercises p. 79
pp. 136-139
pp. 136-139
pp. 136-139
pp. 136-139

p. 126

p. 117

p. 758

Related Basic Laboratory Exercises pp. 3-10
p. 506

Related p. 22, p. 771

Related pp. 366-371

p. 20

Related p. 22, p. 771

p. 23, p.135

Related p. 23, p. 135
Related p. 23, p. 135

p. 147

Basic Laboratory Exercises p. 88

p. 131
p. 121
p. 131

pp. 129-131
p. 147

pp. 129-131
pp. 132-133
p. 131
p. 129-135

Related p. 135

pp. 120-123

Related p. 131
p. 82

p. 134

pp. 214-215
pp. 214-215

pp. 207-201

p. 204
pp. 197-200

pp. 200-204

Related pp. 192-197
Related pp. 192-197
Related pp. 192-197
p. 213
p. 211
p. 209
p. 213
Related pp. 192-197
Related pp. 192-197
Related pp. 192-197

Related pp. 207-210
Related p. 204
Related pp. 197-204
Related pp. 200-204

pp. 260-268
pp. 267-268
pp. 260-265
p. 212
p. 266

p. 280
p. 280
p. 280
p. 280
Related p. 280
Related p. 280

p. 20

p. 217
p. 217
p. 65, p. 217

pp. 366-369
pp. 369-371
pp. 390-393

pp. 380-382
pp. 376-377
p. 383
pp. 384-387
pp. 384-387