Forensic Science Curriculum

Unit I:

- Delineation of expected skills and outcomes to be developed by students
- Introduction of applicable jobs and career research
- The Scientific Method and Laboratory Safety Precautions
- Review major contributors in the history of Forensic Science.

Part II: The Divisions of the Crime Lab
- Divisions of a typical crime laboratory and variation in practice
- Educational and experiential qualifications of a forensic scientist
- Functions and responsibilities of forensic scientist
- Introduction to the microscope

Chapter 1 and supplemental information Ch 7 (section for introduction to microscope)
Course: Forensics

Stage 1 – Desired Results

Relevant GSE’s
PS1-1a, LS3-7a, LS4-10b

What Essential Questions will be considered?
What role does Forensic Science play in the community?
Who does what in a crime lab?

What key knowledge and skills will students acquire as a result of this unit?

<table>
<thead>
<tr>
<th>The students will understand that…</th>
<th>The students will be able to…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the various careers in Forensic Science.</td>
<td></td>
</tr>
<tr>
<td>Explain the scientific method and laboratory safety precautions in the Forensic Science classroom.</td>
<td></td>
</tr>
<tr>
<td>Describe major contributors in the history of Forensic Science.</td>
<td></td>
</tr>
<tr>
<td>Describe the divisions of a crime laboratory.</td>
<td></td>
</tr>
<tr>
<td>Discuss the functions, responsibilities and qualifications of a Forensic Scientist.</td>
<td></td>
</tr>
</tbody>
</table>
Stage 2 – Assessment Evidence

What evidence will show that students understand?

Performance Task(s):
- Students will research a career in forensic science and complete a classroom presentation.
- Students will develop a graphic organizer of types of evidence and divisions of the crime labs.
- Students discuss current media reports that relate to topics in forensic science in a presentation to the class.
- Perform paint chip analysis exercise and introduction to stereomicroscopes.

Portfolio Task(s):
- Students will research a career in forensic science and complete a classroom presentation.

Other evidence/assessments/assignments
1. Teacher daily observations of students while working on career research and project
2. Peer evaluation on career research project
3. Completed career research project
4. Class discussion of scientific method
5. Content and skill based quiz and test on Laboratory procedures and Safety equipment
6. Content based quiz on major benchmarks in the history of forensic science and major contributing scientists in the field.
7. Evaluation of media article
8. Act as an expert witness in a mock trial demonstrating a comparison of control and unknown evidence samples from among those studied so far in the lab. (Oral presentation of evidence)
10. Review representative cases involving the phenomena described in this section.
11. Content and skills based quiz and test.

Student Self-Assessment and Reflection
- Self Reflection on career project
- Student reflect on their own and other students performance in the mock trial and lab work.
- Portfolios
- Cooperative group activity
- Lab
Stage 3 -- Learning Plan

Topics Sequence
- The teacher will introduce the major benchmarks in the history of forensic science and major contributing scientists in the field.
  - Power point presentation: Introduction
- Discuss and model appropriate lab safety procedures.
- The teacher will model for students how to complete research using the Internet and the Career Resource Room
- The teacher will provide students a handout explaining the research project with a list of websites to help them complete their research.
- The teacher will explain the rubrics that will be used to evaluate the project and class discussions.

- Identify the divisions of a typical crime lab and variations used in actual practice.
- Introduce the larger network of scientific experts available to the criminal justice system.
- Describe the Chain of Custody, analysis of evidence and expert testimony as they relate to the forensic scientist.
- Describe the educational and experience based qualifications of the forensic expert.

Suggested Activities
1. Students will create a time line History of Forensic Science
2. Students will research a career path related or Forensic Science, to include job description, educational requirements, pay and benefits, opportunities for employment and advancement.
3. Students will create visuals to include in their presentation.
4. Students will tour the laboratory safety features and sign lab safety agreement
5. Students will have a class discussion of the scientific method as it applied to landmark cases (Frye v. U.S., Coppolino v. State, Daubert v. Merril Dow Pharmaceutical etc.)
6. Students will review and discuss representative cases involving the topics covered in this sections.
7. Court TV: “Forensic Files”
8. Students will find a media article pertaining to forensic and related topics, write a response and discuss it with the class. The assignment is called “What’s New”
9. Act as an expert witness in a mock trial demonstrating a comparison of control and unknown evidence samples from among those studied so far in the lab.
10. Participate in What’s New? Students discuss current media reports that relate to topics in forensic science.
11. Compare and contrast the British and U.S. organizations of crime laboratory delivery systems.
13. Develop a graphic organizer of types of evidence and divisions of the crime labs.
14. Perform comparison of diatoms, comparisons of spores and comparisons of different pollens using the compound microscope.
15. Review representative cases involving the phenomena described in this section.

**Helpful Resources for the Teacher**

- Textbook
- Lab manual/Materials
- Microscopes
- Computer
- Websites
- LCD projector and Power Point Presentations
- Overhead projector and transparencies
- Computers equipped with internet access
- Interactive website links
- Stereomicroscopes
- Videos: Court TV: Forensic Files
- TV/VCR/DVD player

**Unit II**

**Unit Title: II Crime Scene**

- Constitutional Amendments regarding the handling of a crime scene.
- Processing the crime scene

Course: Forensics
Chapter 2: The Crime Scene

**Stage 1 – Desired Results**

**Relevant GSE’s**

PS1-1a, LS2-5a, LS3-7a, LS4-10b

**What Essential Questions will be considered?**

- How do you process a crime scene?
What key knowledge and skills will students acquire as a result of this unit?

<table>
<thead>
<tr>
<th>The students will understand that…</th>
<th>The students will be able to…</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Describe proper legal considerations that are made during the handling of a crime scene.</td>
<td>-Demonstrate how to properly collect, record and package various kinds of evidence from a crime scene.</td>
</tr>
</tbody>
</table>

Stage 2 – Assessment Evidence

What evidence will show that students understand?

**Performance Task(s):**

- Process a crime scene.
- Draw a crime scene to scale of a mock crime scene.

**Portfolio Task(s):**

Other evidence/assessments/assignments

- Content and skills based quiz and test
- Portfolios
- Cooperative group activity
- Short term project
- Long term project
- Oral presentation of evidence
- Written assignments
- Lab Reports

Student Self-Assessment and Reflection

- Reflect and self-assess cooperative group activity
- Reflect and self-assess oral presentation

Stage 3 -- Learning Plan

Topics Sequence

- Describe the proper legal considerations that are made during the handling of a crime scene.
- Present some landmark cases that illustrate how the courts interpret the constitution in its relationship to crime scene searchers.
- Introduce the responsibilities of the first responder.
- Define the components of properly processing the crime scene.
- Illustrate how to properly collect, record and package various kinds of evidence from a crime scene.
- Reinforce the over riding importance of maintaining the Chain of Custody.

**Suggested Activities**

- Participate in What’s New: Newspaper and magazine about current events in Forensics.
- Describe landmark court cases that have contributed to modern crime scene.
- In a group discussion, view a case presentation, and identify the correct or incorrect procedural aspects of processing the scene.
- Find a piece of placed evidence by performing one of the five systemic search patterns. (Ex: Earring in grass.)
- Critical thinking-poses a fictional crime and describes how they would process the crime scene.
- Question and answer with guest speaker. (Crime scene investigator)
- Practice the use of still photography and videography for processing a crime scene.
- Recognize, collect and maintain the integrity of evidence and chain custody at a mock crime scene.
- Draw a sketch, to scale, of a teacher contrived crime scene.
- Evaluate quality of investigations in the videos, “Paradise Lost” and or “The bone Collector”.
- The student will review representative cases involving the phenomena described in this section.
- “Forensic Files” from Court TV

**Helpful Resources for the Teacher**

- Textbook
- Lab manual/Materials
- Microscopes
- Computer
- Websites
- LCD projector and Power Point Presentations
- Overhead projector and transparencies
- Computers equipped with internet access
- Interactive website links
- Stereomicroscopes
- Videos: Court TV: Forensic Files
- TV/VCR/DVD player
### Unit III

**Unit Title III: Physical Evidence and Physical Properties**  
- The Nature and Diversity of Physical Evidence  
- Proper Handling and Analysis of Physical Evidence  
- Classification and Performing Identity  
- Comparisons and Associations of Control and Unknown Evidence

Course: Forensics  
Ch 3 Physical Evidence  
Ch 4 Physical Properties: Glass and Soil  
Ch 8 Hairs, Fibers, and Paint (after organic and inorganic analysis)  
Ch 16-sections of: Document and Voice Examination

### Stage 1 – Desired Results

**Relevant GSE’s**  
PS1-1a, PS2-5b, PS3-8a, LS1-1c, LS2-5a, ESS1-3d,

### What Essential Questions will be considered?

- What is physical evidence?  
- How do you handle physical evidence?

### What key knowledge and skills will students acquire as a result of this unit?

- The students will understand that…  
  - Identify and recognize different types of physical evidence.  
  - Analyze physical evidence including handwriting

- The students will be able to…

### Stage 2 – Assessment Evidence

**What evidence will show that students understand?**

**Performance Task(s):**  
- Lab performance  
- Oral presentation on research articles
**Portfolio Task(s):**

- Lab performance and lab report

**Other evidence/assessments/assignments**

- Content and skills based quiz and test
- Portfolios
- Cooperative group activity
- Short term project
- Long term project
- Oral presentation of evidence
- Written assignments
- Lab Reports

**Student Self-Assessment and Reflection**

- Self Assess and Reflect on
- Lab performance
- Cooperative Activity
- What’s New

**Stage 3 -- Learning Plan**

**Topics Sequence**

- Identify and recognize different types of physical evidence.
- Describe the difference between individual and class characteristics of physical objects, and give example.
- Understand the importance of statistical analysis in evaluating the weight of physical evidence.
- Distinguish between destructive and nondestructive analysis and give examples.
- Explain with demonstrations, how to package and maintain the different types of physical evidence.
- Relate how physical evidence contributes to the overall process of reconstruction of a crime.
- Revisit the importance of The Locard Principle
- Recognize a variety of techniques used to analyze handwriting samples.
- Describe the process and principles of paper chromatography.
- Delineate some similarities and differences between various types of papers.
- Presentation on firearm markings- the guns as a production machine leaving tool marks on slugs and casings.
- Define and illustrate voice print examination as a means of personal identification. (Ch 16 Document and Voice Examination)

**Suggested Activities**

- Participate in What’s New?
- Create a description of a physical object, and subsequently identify if from a class of similar objects—carpet tack comparison.
- Perform a lab examination of vacuum sweepings to compare control samples and samples of unknown origin.
- Homework assignment: Make a shoe cast and an inked impression of the same shoe and construct a formal, fifteen point, comparison suitable as a court exhibit.
- Court TV: “Forensic Files”
- Possible Laboratory Tasks:
  - Stratification of soil—soil density.
  - Comparison of hairs and fibers.
  - Inked tire impression comparison to photo of tire impression.
  - Laboratory comparison made in modeling clay of unknown tool marks and student made control casts of tool marks made in modeling clay.
  - Examination of series of production pieces to illustrate tool and die marks.
  - Pliers marks, hammer marks and other tool mark comparisons—controls to unknown.
  - Examination of lead flashing strips to compare striation lines controls to unknown samples.
  - Comparison of control and unknown bullet slugs and casings
  - Reconstruct physical fits including broken headlight and clay pot
  - Simple chromatography tests
  - Chromatography of inks to compare control and unknown samples.

Class Project- create a school’s reference set of control pollen samples on permanent slide mounts. Set can be added to year after year.
Create a school’s reference set of spores, hairs from different species (Impress in clear nail polish to reveal scales) and fibers. Students can practice classification principles to rationally organize the sets.

Analyze the impact of landmark case like Frye vs. US (1923), Coppolino v. Florida (1968), and Daubert Merril Dow Pharmaceuticals (1993) to review statistical on the field.

- The student will review other representative cases involving the phenomena described in this section.

**Helpful Resources for the Teacher**
- Textbook
- Lab manual/Materials
- Microscopes
- Computer
- Websites
- LCD projector and Power Point Presentations
- Overhead projector and transparencies
- Computers equipped with internet access
- Interactive website links
- Stereomicroscopes
- Videos: Court TV: Forensic Files
- TV/VCR/DVD player

Unit IV

Unit Title: IV: Fingerprints/Bodily impressions
- History of Personal Identification Systems
- Embryology and Physiology of Friction Skin
- Patterns and Ridge Characteristics of Fingerprints
- Classification Systems of Fingerprints
- Retrieving and Developing Latent Fingerprints.
- Patterns from Other Skin Area, Gloves and other Impressions.

Course: Forensics
Chapter 14 Fingerprints
Ch 15: Firearms, Tool marks and other impressions.

Stage 1 – Desired Results

Relevant GSE’s

PS1-1a, PS2-5b, PS3-8a, PS3-9b, PS3-10a, LS2-5a,

What Essential Questions will be considered?
- How are fingerprint taken?
**What key knowledge and skills will students acquire as a result of this unit?**

<table>
<thead>
<tr>
<th>The students will understand that…</th>
<th>The students will be able to…</th>
</tr>
</thead>
<tbody>
<tr>
<td>-The use of fingerprints in History.</td>
<td>-Describe and demonstrate techniques for taking fingerprints.</td>
</tr>
<tr>
<td>-Compare and contrast fingerprints for identification.</td>
<td>-Compare and contrast fingerprints for identification.</td>
</tr>
</tbody>
</table>
### Stage 2 – Assessment Evidence

**What evidence will show that students understand?**

<table>
<thead>
<tr>
<th>Performance Task(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Roll fingerprints and perform classification.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Portfolio Task(s):</th>
</tr>
</thead>
</table>

**Other evidence/assessments/assignments**

- Content and skills based quiz and test
- Portfolios
- Cooperative group activity
- Short term project
- Long term project
- Oral presentation of evidence
- Written assignments
- Lab Report

**Student Self-Assessment and Reflection**

- Portfolios
- Cooperative group activity
- Lab
- Project
Stage 3 -- Learning Plan

Topics Sequence

- Review the history of the use of fingerprints for personal identification.
- Present the embryonic development and anatomy and physiology of fingerprints.
- The biology and chemistry of perspiration.
- Illustrate examples of intentional and accidental alterations of fingerprints.
- Distinguish between three main pattern types of fingerprints.
- Teach the rules for the Henry system for the primary, secondary and sub-secondary classification of a representative fingerprint card.
- Describe and demonstrate techniques for developing and lifting latent prints.
- Techniques of comparison of control and unknown prints.
- Explain the nature and use of the Automated Fingerprint Identification System (AFIS)
- Illustrate the forensic value of glove prints and other identifying impressions.

Suggested Activities

- Participate in What’s New? Students discuss current media reports that relate to topics in Forensic Science.
- Roll one’s own fingerprint card and perform primary, secondary and sub-secondary classification.
- Pool the fingerprints of the class as single print file with a rational classification system.
- Practice the discovering, developing and lifting of latent fingerprints from various sources using various development media.
  - Physical methods: powders magna powder and brush, anthracene
  - Chemical developments: ninhydrin, cyanoaclylate
  - Tape lifts, hinge lifters, transparent and opaque.
- Develop and lift several latent fingerprints and attempt to match them in the single print file.
- Make a formal fingerprint comparison identifying 12 points in common between a latent and the control print from the single print file. This should be suitable as a court exhibit.

- Use Adobe Photoshop to clean and enhance a latent print lift.
- Collect ear, lip and wrist band impressions
- Examine several types of gloves for identifying characteristics.

- The student will review representative cases involving the phenomena described in this section.

Helpful Resources for the Teacher

- Textbook
- Lab manual/Materials
- Microscopes
-Computer
-Websites
-LCD projector and Power Point Presentations
-Overhead projector and transparencies
-Computers equipped with internet access
-Interactive website links
-Stereomicroscopes
-Videos: Court TV: Forensic Files
-TV/VCR/DVD player

Unit V

Unit Title: Unit V Medico-Legal Aspects of Death
-Corpus Delecti
-What is Death?
-Medico-legal examination-The Corpse as Physical Evidence
-Mechanics of locating clandestine graves
-Evaluation of Putrid Remains
-Evaluation of Skeletal Remains

Course: Forensics

Stage 1 – Desired Results

Relevant GSE’s
PS1-1a, LS2-5a

What Essential Questions will be considered?
What causes Death?

What key knowledge and skills will students acquire as a result of this unit?

<table>
<thead>
<tr>
<th>The students will understand that…</th>
<th>The students will be able to…</th>
</tr>
</thead>
</table>

Define matter and structure of an atom
Explain the electromagnetic spectrum and it’s relationships between wavelength, amplitude and energy.
Describe the principles of the various analytical techniques.

Stage 2 – Assessment Evidence
**What evidence will show that students understand?**

**Performance Task(s):**
- Present current media reports in class
- Research paper

**Portfolio Task(s):**

**Other evidence/assessments/assignments**
- Content and skills based quiz and test
- Portfolios
- Cooperative group activity
- Short term project
- Long term project
- Oral presentation of evidence
- Written assignments
- Lab Reports

**Student Self-Assessment and Reflection**
- Self Assess and Reflect on
- Lab performance
- Cooperative Activity
- What's New
- Research Paper
Stage 3 -- Learning Plan

Topics Sequence

- Identify the legal considerations surrounding death.
- Differentiate between tissue death and organism death (Time since death)
- Outline the purposes and procedures of forensic autopsies.
- Explain the five "manners" of death.
- Identify the causes of death.
- Identify the mechanisms of death
- Define adipocere, mummifications, and putrefaction
- Illustrate the contributions of photography, cadaver dogs, trackers, the use of steel rods, ground penetration radar, and evaluation of changes in vegetation to the finding of clandestine graves.
- Describe the Forensic Anthropologist’s role in determining time since death.
- Present the ecological role of flies, beetles, and mites on the human and animal corpse. (Forensic Entomology)
- Present the ecological role of scavengers on the corpse, and the forensic tracker’s contribution in the interpretation of a grave site.
- Explain the basis upon which forensic anthropologist can base an opinion as to manner and cause of death, age, sex, race or geographical origin, height, and socioeconomic status of the deceased from skeletonized remains
- Illustrate the use of facial reconstruction techniques- include both photo overlays and clay reconstruction
- Illustrate identification of skeletonized remains by means other than facial reconstruction: Malformation, fractures, odontology, pins and other prostheses.
- Describe the use of cosmetic prostheses by undertakers.

Suggested Activities

- What’s New? Students discuss current media reports that relate to topics in forensic science
- Review and critique LA coroner’s Series Video Tapes
- Video: HBO Autopsy
- Review a Jane/John doe autopsy report
- Student will contact State/Health Statistics and research causes of death statistics in RI over the last several years.
- Review slides of photographs of the different manner, modes and causes of death.
- Homicide detective presentation with question and answer period.
- Attend presentation by a contributing expert to locating of clandestine graves.
- Write a research paper on clandestine graves
- Culture fruit flies and observe and record developmental stages under varying temperatures.
- Evaluate human bones or plastic replicas in an effort to determine characteristics of the deceased.
- Review and critique the Nova Film- The Franklin Expedition- Men on Ice.
- Examine full mouth x-rays to observe individualizing characteristics
- Observe x-rays of pins, artificial joints and bone calluses in humans
- The student will review representative cases involving the phenomena described in this section.

**Helpful Resources for the Teacher**

- Textbook
- Lab manual/Materials
- Microscopes
- Computer
- Websites
- LCD projector and Power Point Presentations
- Overhead projector and transparencies
- Computers equipped with internet access
- Interactive website links
- Stereomicroscopes
- Videos: Court TV: Forensic Files
- TV/VCR/DVD player

**Unit VI**

**Unit Title: Unit VI Inorganic Analysis**

- What is Matter?
- Structure of an Atom
- The Electromagnetic Spectrum
- Some Atoms of Forensic Interest
- Elemental Analysis
- Analysis of Molecules

**Course: Forensics**

**Chapter 6**

**Stage 1 – Desired Results**

**Relevant GSE's**

PS1-1a, PS1-4a, PS3-10b, LS2-5a
**What Essential Questions will be considered?**

How can you tell the difference between different types of matter?

---

**What key knowledge and skills will students acquire as a result of this unit?**

<table>
<thead>
<tr>
<th>The students will understand that…</th>
<th>The students will be able to…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe matter and how an atom acts</td>
<td>Describe and explain the electromagnetic spectrum.</td>
</tr>
<tr>
<td>Explain X-Ray Diffraction</td>
<td></td>
</tr>
</tbody>
</table>
## Stage 2 – Assessment Evidence

### What evidence will show that students understand?

#### Performance Task(s):

- Participate in What’s New: Class Discussion
- Students will construct a graphic organizer on the electromagnetic spectrum
- Lab

#### Portfolio Task(s):

- Lab

### Other evidence/assessments/assignments

- Content and skills based quiz and test
- Portfolios
- Cooperative group activity
- Short term project
- Long term project
- Oral presentation of evidence
- Written assignments
- Lab Reports

### Student Self-Assessment and Reflection

- Portfolio
- Lab performance
- Cooperative Activity
- What’s New
Stage 3 -- Learning Plan

Topics Sequence

Define matter
Describe the structure of an atom, in ground and excited states.
Describe the phenomena of radioactivity and florescence.
Present an overview of the electromagnetic spectrum with a discussion of the relationships between wavelength, amplitude and energy
Explain the interactions between atoms and components of the electromagnetic spectrum.
Describe the principles of operation and the use of the following analytical techniques and related instruments: Atomic Absorption Spectra, Emission Spectra, Neutron Activation Analysis and X-Ray Emission Analysis
Explain X-Ray Diffraction as a mean of analyzing molecules.

Suggested Activities

Participate in What’s New? Students discuss current media reports that relate to topics in forensic science.
Define matter, substance, element, atom, compound, molecule, mixture, solution, and states of matter.
Describe some forensic applications using radioactivity.
Describe forensic uses of fluorescence.
Define the various groupings of radiations across the electromagnetic spectrum components.
Describe the relationships between energy, wavelength, and amplitude in spectrum components.
Explain the workings of the visible range spectrophotometer and its potential uses in the forensic laboratory.
Explain the workings of the spectroscope and observe the instructor’s demonstration of flame-excited emissions of barium chloride, sodium chloride and potassium chloride.
Show an understanding of the scanning electron microscope (SEM) when used as a stimulus for x-ray emission and analysis.
The student will review representative cases involving the phenomenon described in this section.
The student will review representative forensic cases involving the phenomena described in this section.

Helpful Resources for the Teacher
Unit VII

Unit Title: VII: Organic Analysis (Ch5) and Drugs (Ch9)
-What is an Organic Substance?
-Chain and Ring Compounds—some representative molecules of forensic interest.
-Drugs and Toxicology
-Analytical Instrumentation applied to identification and quantification of Organic Substances
-Ethanol as a Substance of Abuse
-The Clandestine Laboratory

Course: Forensics
Chapter 5: Organic Analysis
Chapter 9: Drugs

Stage 1 – Desired Results

Relevant GSE’s
PS1-1a, PS2-5a, PS3-10, LS2-5a, LS4-10

What Essential Questions will be considered?
How are organic substances used and analyzed?
**What key knowledge and skills will students acquire as a result of this unit?**

<table>
<thead>
<tr>
<th>The students will understand that…</th>
<th>The students will be able to…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss the various types of organic substances, how they are used and analyzed including scheduled and non scheduled substances.</td>
<td></td>
</tr>
</tbody>
</table>

**Stage 2 – Assessment Evidence**

**What evidence will show that students understand?**

*Performance Task(s)*:

- Presentation on the impact on the sociological, economic, and health issues of various substance abusers.
- Lab on Paper Chromatography

*Portfolio Task(s)*:

- Lab

**Other evidence/assessments/assignments**

- Content and skills based quiz and test
- Portfolios
- Cooperative group activity
- Project
- Oral presentation of evidence
- Written assignments
- Lab Reports

**Student Self-Assessment and Reflection**

- Portfolios
- Cooperative group activity
- Project
## Stage 3 -- Learning Plan

### Topics Sequence

- Distinguish between organic and inorganic substances with examples.
- Define valence and illustrate the basis of valence of Carbon, Hydrogen, Oxygen and Nitrogen. Show some appropriate examples with illustrative examples.
- Present notable cases of classic poisoning in the history of forensic files (ex. Trial of Madame Lafarge-A case of poisoning with Arsenic, the Aqua Tofana Society Poisonings and Coppolino v. Fla etc.
- Differentiate the classes of scheduled substances as defined by the Controlled Substances Act, and describe substances of abuse that are non-scheduled (ex: Prozac, Ambien, Nitrous Oxide etc)
- Present the phenomena of tolerance and addiction with examples of forensic importance (See Saferstein Ch 9, 8th ed)
- Describe the physiological effects and the chemistry of some street drugs in common abuse today (ex: Cocaine, Heroin, Methyleneoxyamphetamine (MDMA), LSD. Marijuana or other controlled substances.
- Describe the mechanisms and use of the following analytical techniques:
  - Paper or Thin Layer Chromatography
  - High Pressure Liquid Chromatography
  - Infrared, Ultraviolet, Visible and Fluorescence Spectroscopy
- Present Ethyl Alcohol as a substance of abuse including physiological and psychological aspects of abuse, domestic violence issues and driving while intoxicated offenses, Driving under the influence (DUI)
- Describe a typical Clandestine Laboratory and its contents.
- Describe the inherent dangers of Clandestine Laboratory investigation and raids. (Organic solvent explosions, toxicity of concentrated drugs, booby traps and desperate offenders.)
- Review safety precautions with personnel.
Suggested Activities

- Draw schematics, showing valences of C, H, O, N
- Determine the frequency of abuse of the various street drugs using statistics from the Rhode Island Dept. of Health Forensic Laboratory
- Participate in teacher directed discussion of unscheduled but abused substances, and the pros and cons of legalizing a previously scheduled substance (Marijuana?) Debate format.
- Present a research paper on the history of scheduling, of abuse, physiological effects, and impact on society of two commonly abused street drugs of the student’s choice.
- Perform paper chromatography of stimulated Marijuana (Chlorophyll extracted from crushed fresh spinach.)
- Use Spectrophotometer (Absorption Spectrum for Methylene blue dye, and quantitative determination of Methylene blue solutions.
- Critically review a demonstration of a breathalyzer (Intoxilyzer) by a qualified operator.
- Observe effects of catnip on teacher’s cat? An example of a euphoric effect?
- Write a (5) page research paper or Presentation on the impact on the sociological, economic, and health issues of the alcohol abuser.
- Review videotapes of Clandestine laboratory raids and associated hazards.
- Attend a speaker session on clandestine laboratories by a qualified expert.
- The student will review representative cases involving the phenomena described in this section.

Helpful Resources for the Teacher

- Textbook
- Lab manual/Materials
- Microscopes
- Computer
- Websites
- LCD projector and Power Point Presentations
- Overhead projector and transparencies
- Computers equipped with internet access
- Interactive website links
- Stereomicroscopes
- Videos: Court TV: Forensic Files
- TV/VCR/DVD player

Unit VIII
## Stage 1 – Desired Results

### Relevant GSE’s

- PS1-1a, PS3-8a, PS3-8b, LS2-5a, LS2-2a, LS3-7a

### What Essential Questions will be considered?

- What is Blood and DNA?
- How are Blood and DNA analyzed?

### What key knowledge and skills will students acquire as a result of this unit?

- The students will understand that…
- The students will be able to…

- Explain proper methods of collection and identification of blood.
- Describe how DNA and mutations lead to identification.
- Explain the various forensic analysis methods for DNA.
Stage 2 – Assessment Evidence

What evidence will show that students understand?

**Performance Task(s):**
- Lab experiment of blood typing
- Lab on simulated blood spatter
- Research and discuss DNA project and current events.

**Portfolio Task(s):**
- Lab

Other evidence/assessments/assignments
- Content and skills based quiz and test
- Portfolios
- Cooperative group activity
- Project
- Oral presentation of evidence
- Written assignments
- Lab Reports

Student Self-Assessment and Reflection
- Portfolios
- Cooperative group activity
- Project
### Stage 3 -- Learning Plan

#### Topics Sequence

- Teach the anatomy and physiology of blood and blood circulatory system.
- Explain proper methods, regarding the collection of and the identification of blood as to species and human blood type (ABO) system and Rh factors.
- Describe the analysis of blood spatter patterns at the crime scene.
- Present human chromosome, abnormalities and syndromes with historical relationships to forensic science.
- Illustrate the structure and biological functions of DNA.
- Review the replication of DNA in the cell.
- Define some mechanisms of mutability in DNA, and how mutations lead to individual identification of suspects in criminal and civil cases.
- Describe forensic analysis methods including RFLP, VNTR, STR, PCR. Sequencing (mitochondrial DNA).
- Explain STR and the statistical power of multiplexing.
- Illustrate the various uses of DNA other than for human identification.
- Review the historical quest for admissibility of DNA evidence-A classic example of novel science entering the court system.
- Explanation of the value of these body fluids and excretions to forensic analysis.
- Collection and analysis of rape evidence.

#### Suggested Activities

- Perform blood typing and classification with simulated human ABO blood types.
- What’s New- students will collect and discuss current news items on DNA and body fluid evidence and other forensic areas.
- Perform laboratory exercise of dropping simulated blood from varying heights and angles.
- Describe the nature of antigens and antibodies and immune response.
- Review and critique a video of blood splatter analysis from a crime scene, or analysis of blood splatter (simulated blood).
- View and critique a video on use of luminal and alternative light source at a crime scene (or present a speaker demonstrating these tools).
- Observe chromosomes in cell division.
- Work with models of the DNA molecule- to reinforce the concepts of base paring of semi-conservative replications.
- Complete gel electrophoresis to compare DNA samples.
- Write collaborative laboratory reports on exercise on this unit.
- View and critique video depicting forensic DNA analysis in the laboratory.
- Write a report on history of DNA evidence introduction to the courts.
- Students will research and discuss the issues surrounding the CODIS system.
- Group discussion of the use of DNA in soil classification and identification of individual plants and animals etc.
Discuss the functions of the DNA (Innocence) Project freeing the innocent. The student will review representative cases involving the phenomena described in this section.

Helpful Resources for the Teacher

- Textbook
- Lab manual/Materials
- Microscopes
- Computer
- Websites
- LCD projector and Power Point Presentations
- Overhead projector and transparencies
- Computers equipped with internet access
- Interactive website links
- Stereomicroscopes
- Videos: Court TV: Forensic Files
- TV/VCR/DVD player

Unit IX

Unit Title: IX: Fires, Arson and Explosion
-A Model Arson Law-legal definitions and motivations
-The Chemistry of Combustion (fire and explosions)
-Securing and Processing a Fire Scene
-Laboratory Analysis of Arson related Evidence

Course: Forensics
Chapter 15: Firearms, tool marks, and other impressions (partly completed before in impressions Unit
Chapter 11: Forensic Aspects of Arson and Explosion Investigations

Stage 1 – Desired Results

Relevant GSE’s
PS1-1a, PS2-5a, PS3-8a, LS2-5a

What Essential Questions will be considered?

How did the fire start and spread?
### What key knowledge and skills will students acquire as a result of this unit?

<table>
<thead>
<tr>
<th>The students will understand that…</th>
<th>The students will be able to…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the various degrees of arson.</td>
<td>Describe motives of arson.</td>
</tr>
<tr>
<td>Describe what is needed to start and what allows a fire to spread.</td>
<td>Identify substances used based on properties.</td>
</tr>
<tr>
<td>Demonstrate proper methods of collecting physical evidence at a fire scene and explain technique.</td>
<td>Explain fire and explosion patterns.</td>
</tr>
</tbody>
</table>

### Stage 2 – Assessment Evidence

#### What evidence will show that students understand?

**Performance Task(s):**
- Class Discussions
- Lab
- Current event research

**Portfolio Task(s):**

#### Other evidence/assessments/assignments

- Content and skills based quiz and test
- Portfolios
- Cooperative group activity
- Short term project
- Long term project
- Oral presentation of evidence
- Written assignments
- Lab Reports

#### Student Self-Assessment and Reflection

- Portfolios
- Class Discussions
**Stage 3 -- Learning Plan**

**Topics Sequence**

- Distinguish between the various degrees of arson as described by a Model Arson Law
- Describe various motives for the commission of arson including financial, revenge, concealment of other crimes and psychopathology.
- Explain the use of video recording of the crowd at a fire scene.
- Ingredients necessary to a fire or explosion.
- Nature of fuel as determinants of flame and smoke color and intensity of fire.
- Describe the use of video in recording the fire and the fire scene.
- Illustrate methods of collecting physical evidence at a fire scene.
- Show fire and explosion patterns
- Describe some indicators of fire intensity at the fire scene
- Explain the properties of some common accelerants used in incendiary fires. (use discretion.
- Demonstrate techniques for collecting and analyzing physical evidence of the use of accelerants and explosives.

**Suggested Activities**

- Describe the elements found in a Model Arson Law
- Identify the components necessary for fire.
- What’s new? Discuss current media reports that relate to topics in forensic science.
- Identify the necessary elements of explosion and explain why they are needed.
- Recognize the steps for recreating an arson scene.
- Compare and contrast the various degrees of arson by creating a table or a poster.
- Explain the role of the Forensic Accountant in arson investigation.
- Discuss the phenomenon of pyromania.
- Critique a demonstration of fire patterns with and without accelerants.
- Discuss the phenomena of a flash point, ignition temperature and physical states of some commonly available accelerants.
- Describe methods of identifying, collecting, and preserving physical evidence at a fire or explosion scene.
- Explain the factors involved in determining whether high or low velocity explosives have been used.
- Review and critique a video of an arson and/or explosion scene.
- Analyze possible ignition sources, fuels and oxygen supplies of common house fires.
- Examine mock incendiary devices as evidence of arson (teacher discretion advised)
- Research a specific case of bombings or arson on the internet.

Have student describe the use of presumptive field tests and confirmatory tests for accelerants.
-Discuss the use and application of the various instruments in the laboratory for detecting the presence of accelerants and explosive residues (HPLC, GC, GCM, Infrared spectrometry etc.).
-The student will review representative cases involving the phenomena described in this section.

Helpful Resources for the Teacher
-Textbook
-Lab manual/Materials
-Microscopes
-Computer
-Websites
-LCD projector and Power Point Presentations
-Overhead projector and transparencies
-Computers equipped with internet access
-Interactive website links
-Stereomicroscopes
-Videos: Court TV: Forensic Files
-TV/VCR/DVD player

Unit X
Unit: X: Cutting Edge Technology and the Future of Forensic Science
-Coordination of Information: National and International Database development
-Global Positional Systems and worldwide tracking
-Advances in laboratory instrumentation and analysis
-Automation and simplification of DNA analysis

Course: Forensics
Chapters 17-19
  Ch 17 Computer Forensics
  Ch 18 Forensic Science and the Internet
  Ch 19 The Future

Stage 1 – Desired Results

Relevant GSE's

PS1-1a, LS2-5a
What Essential Questions will be considered?

What technology is used in forensics?
How do we communicate?

What key knowledge and skills will students acquire as a result of this unit?

<table>
<thead>
<tr>
<th>The students will understand that…</th>
<th>The students will be able to…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the systems set up to organize and communicate physical evidence such as IBIs, AFIS, CODIS.</td>
<td></td>
</tr>
<tr>
<td>Explain how the use of technology has increased over the years.</td>
<td></td>
</tr>
<tr>
<td>Discuss the pros and cons of technology in the courtroom.</td>
<td></td>
</tr>
</tbody>
</table>
## Stage 2 – Assessment Evidence

**What evidence will show that students understand?**

<table>
<thead>
<tr>
<th>Performance Task(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio</td>
</tr>
<tr>
<td>Class Discussions</td>
</tr>
<tr>
<td>Activities</td>
</tr>
</tbody>
</table>

| Portfolio Task(s): |

## Other evidence/assessments/assignments

- Content and skills based quiz and test
- Portfolios
- Cooperative group activity
- Short term project
- Long term project
- Oral presentation of evidence
- Written assignments
- Lab Reports

## Student Self-Assessment and Reflection

<table>
<thead>
<tr>
<th>Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Discussions</td>
</tr>
<tr>
<td>Debate</td>
</tr>
</tbody>
</table>
# Stage 3 -- Learning Plan

## Topics Sequence

Course content will survey the following database and their uses.

**Physical evidence:**
- PDQ (Paint Data Query)
- IBIS (Integrated Ballistic Identification system).
- AFIS (Automated Fingerprint Identification system).
- Ink and paper databases.

**Biometric evidence:**
- Facial Recognition databases.
- Brain Fingerprinting (reading brain wave responses during the interviews).
- Multi-Channel emotional response detection
- Advanced in Personal Identification.

**Microchemistry analysis of Physical evidence.**

- CODIS (Combined DNA identification system).
- GPS as a means of tracking suspect cargo and substances subject to potential illegal or terrorism uses.

## Suggested Activities

The student will:
- Participate in What’s new? Students share newly found media articles on topics of interest to forensic science.
- Do a research report one of the latest coordinated information systems described in the content section.
  Of this area focus.
- Have the students act as mock committee for the dispersal of developmental funding for new innovations and improvements forensic science.
- Debate on pros and cons on technology in the courtroom.
- The student will review representative cases involving the phenomena in this section.

### Helpful Resources for the Teacher

- Textbook
- Lab manual/Materials
- Microscopes
- Computer
- Websites
- LCD projector and Power Point Presentations
- Overhead projector and transparencies
- Computers equipped with internet access
- Interactive website links
- Stereomicroscopes
- Videos: Court TV: Forensic Files
- TV/VCR/DVD player