



SPRING GROVE AREA SCHOOL DISTRICT



PLANNED COURSE OVERVIEW

Course Title: Forensic Science Grade Level(s): 10 - 12 Units of Credit: .5 Classification: Elective		Length of Course: Half year Periods Per Cycle: 6 Length of Period: 40 Minutes Total Instructional Time: 60 Hours	
Course Description			
<p>Students will explore the Biology, Physics, and Chemistry behind crime scene investigations. They will be introduced to and demonstrate scientific procedures used in current forensic science practices and apply scientific knowledge and skills to solving criminal and civil cases. Topics to be explored include but are not limited to the history of forensic science, fingerprint analysis, toxicology, biological evidence, ballistics, chromatography, and more. Career exploration opportunities will also be provided.</p> <p><i>Prerequisite: Completion of Biology</i></p>			
Instructional Strategies, Learning Practices, Activities, and Experiences			
Bell Ringers Closure Appropriately Chunked Lessons		Classroom Laboratory Activities Virtual Laboratory Activities	
Assessments			
Teacher Specific Assessments (Quizzes, Unit Exams, Closure, etc.)		Laboratory Reports	
Materials/Resources			
Forensic Science Textbook		Forensic Science Laboratory Manual	
Teacher-Provided Materials (Notes, Labs, Remediation, Enrichment Materials)			

Adopted: 5/22/23

Revised:

https://springgroveareascho.sharepoint.com/sites/PrivateSGASD/Shared Documents/AASG/NEWCURR/SCIENCE/2023/HS Science Elective Courses/Forensic Science/Forensics_Overview.docx

<p>I. Introduction to Forensic Science</p>	
<p>CONTENT/KEY CONCEPTS</p>	<p>OBJECTIVES/STANDARDS</p>
<ul style="list-style-type: none"> ● Definition and Scope of Forensic Science ● History of Forensic Science ● Organization of Crime Labs ● Functions of the Forensic Scientist ● Careers in Forensic Science 	<ol style="list-style-type: none"> 1. Students will be able to distinguish between forensic science and criminalistics. 2. Students will be able to describe the organization and services of a typical comprehensive crime laboratory in the criminal justice system. 3. Students will be able to explain how physical evidence is analyzed and presented in the courtroom by the forensic scientist, and how admissibility of evidence is determined in the courtroom. 4. Students will be able to investigate a variety of careers that fall under the umbrella of forensic science. <p>NGSS Standards</p> <p>HS-LS1-1: From Molecules to Organisms: Structures and Processes. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.</p> <p>HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.</p> <p>HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</p> <p>HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</p> <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> <p>HS-PS2-1: Motion and Stability: Forces and Interactions. Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.</p> <p>HS-PS2-3: Motion and Stability: Forces and Interactions. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.</p>

II. Crime Scene Investigation and Evidence Collection	
CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
<ul style="list-style-type: none"> ● Physical Evidence and the Crime Scene ● Safety in the Field ● Types of Physical Evidence ● Examination of Physical Evidence ● Forensic Databases 	<ol style="list-style-type: none"> 1. Students will be able to describe the various measures taken while securing, recording, and searching the crime scene. 2. Students will be able to describe proper techniques for packaging common types of physical evidence. 3. Students will be able to explain the concept of chain of custody. 4. Students will be able to relate what steps are typically required to maintain appropriate health and safety standards at the crime scene. 5. Students will be able to discuss the common types of physical evidence encountered at crime scenes. 6. Students will be able to summarize the significance of physical evidence and the steps involved in its analysis. 7. Students will be able to explain the function of national databases available to forensic scientists. <p>NGSS Standards</p> <p>HS-LS1-1: From Molecules to Organisms: Structures and Processes. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.</p> <p>HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.</p> <p>HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</p> <p>HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</p> <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> <p>HS-PS2-1: Motion and Stability: Forces and Interactions. Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.</p> <p>HS-PS2-3: Motion and Stability: Forces and Interactions. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.</p>

<p>III. Trace Evidence – Hair and Fiber</p>	
<p>CONTENT/KEY CONCEPTS</p>	<p>OBJECTIVES/STANDARDS</p>
<ul style="list-style-type: none"> • Forensic Examination of Hair • Forensic Examination of Fibers 	<ol style="list-style-type: none"> 1. Students will be able to discuss the morphology of hair, including the three phases of hair growth. 2. Students will be able to discuss the considerations and questions concerning forensic hair examinations. 3. Students will be able to describe the proper collection and preservation of forensic hair evidence. 4. Students will be able to differentiate between and explain the different types of fibers. 5. Students will be able to explain the properties of fibers that are most useful for forensic comparisons. 6. Students will be able to describe the proper collection and preservation of forensic fiber evidence. <p>NGSS Standards</p> <p>HS-LS1-1: From Molecules to Organisms: Structures and Processes. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.</p> <p>HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.</p> <p>HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</p> <p>HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</p> <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p>

<p>IV. Fingerprinting</p>	
<p>CONTENT/KEY CONCEPTS</p>	<p>OBJECTIVES/STANDARDS</p>
<ul style="list-style-type: none"> ● Principles of Fingerprinting and Fingerprints ● Classification of Fingerprints ● Fingerprint ID Systems ● Methods of Detecting Fingerprints ● Preservation of Fingerprints ● Digital Enhancement of Fingerprints ● Next Generation Identification System 	<ol style="list-style-type: none"> 1. Students will be able to summarize the three fundamental principles of fingerprints. 2. Students will be able to explain the primary classification system of fingerprints. 3. Students will be able to describe the concept of an automated fingerprint identification system (AFIS). 4. Students will be able to describe visible, plastic, and latent fingerprints and the techniques for developing latent fingerprints. 5. Students will be able to describe the proper procedures for preserving a developed latent fingerprint. 6. Students will be able to explain the scope of the FBI's Next Generation Identification System. <p>NGSS Standards</p> <p>HS-LS1-1: From Molecules to Organisms: Structures and Processes. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.</p> <p>HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.</p> <p>HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</p> <p>HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</p> <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p>

<p>V. Biological Evidence</p>	
<p>CONTENT/KEY CONCEPTS</p>	<p>OBJECTIVES/STANDARDS</p>
<ul style="list-style-type: none"> • Nature of Blood • Immunoassay Techniques • Characteristics of Bloodstains • Bloodstain Formation • Bloodstain Spatter Patterns • The Role of Forensic Toxicology • Toxicology of Alcohol • Testing for Intoxication • The Analysis of Blood for Alcohol • The Role of the Toxicologist • Understanding DNA • Replication of DNA • DNA Typing • Polymerase Chain Reaction (PCR) • Short Tandem Repeats (STRs) • Mitochondrial DNA • Collection and Preservation of DNA 	<ol style="list-style-type: none"> 1. Students will be able to explain the nature of blood and the concept of antigen-antibody interactions. 2. Students will be able to explain the application of serology in typing whole blood. 3. Students will be able to describe forensic tests used to characterize a stain as blood. 4. Students will be able to summarize the principles of crime-scene reconstruction and the personnel involved in reconstruction. 5. Students will be able to describe the general features of bloodstain formation. 6. Students will be able to discuss the methods to determine the area of convergence and area of origin for impact spatter patterns. 7. Students will be able to describe how various blood pattern types are created and which features of each pattern can be used to aid in reconstructing events at a crime scene. 8. Students will be able to describe the methods for documenting bloodstain patterns at a crime scene. 9. Students will be able to explain how alcohol is absorbed into the bloodstream, transported throughout the body, and eliminated by oxidation and excretion. 10. Students will be able to describe the process by which alcohol is excreted in the breath via the lungs. 11. Students will be able to explain the methods used to determine alcohol intoxication. 12. Students will be able to explain the process involved in the analysis of blood for alcohol. 13. Students will be able to describe the role of the forensic toxicologist and the techniques they use to identify substances with a forensic toxicology result. 14. Students will be able to describe the structure of DNA. 15. Students will be able to explain how the amino acid sequence in a protein chain is determined by the structure of DNA. 16. Students will be able to explain the phenomenon of DNA replication and the impact of the PCR technique on duplicating DNA strands. 17. Students will be able to discuss STR analysis and the concept of electrophoresis. 18. Students will be able to describe the difference between nuclear and mitochondrial DNA. 19. Students will be able to describe the necessary procedures for the proper preservation of bloodstained evidence for laboratory DNA analysis.

<p>V. Biological Evidence (Continued)</p>	
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VI. Ballistics, Toolmarks, and Other Impressions	
CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
<ul style="list-style-type: none"> • Gunpowder Residues • Primer Residues on the Hands • Tests for Primer Residues • Collection and Preservation of Firearms Evidence • Toolmarks, Footwear, Tire Impressions 	<ol style="list-style-type: none"> 1. Students will be able to understand the various search systems developed for the FBI and ATF. 2. Students will be able to explain the procedure for determining how far a weapon was fired from a target. 3. Students will be able to explain the laboratory tests for determining whether an individual has fired a weapon. 4. Students will be able to explain the procedures for collecting and preserving firearms evidence. 5. Students will be able to explain the forensic significance of class and individual characteristics to the comparison of tool mark, footwear, and tire impressions. 6. Students will be able to explain the preservation, lifting, casting, and comparison of impressions left at a crime scene. <p>NGSS Standards</p> <p>HS-LS1-1: From Molecules to Organisms: Structures and Processes. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.</p> <p>HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.</p> <p>HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</p> <p>HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</p> <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> <p>HS-PS2-1: Motion and Stability: Forces and Interactions. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.</p> <p>HS-PS2-3: Motion and Stability: Forces and Interactions. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.</p>