

# Pequannock Township School District

## Curriculum Syllabus

### Forensics, Grades 11/12

## Course Description:

Forensic Science, or Criminalistics, is the application of science to criminal and civil laws enforced by police and other agencies. In this course students will be able to obtain fundamental knowledge of the history, organization, procedure, application, and limitations of Forensic Science. The course will provide students with laboratory skills necessary for identification and comparison of evidence; rely heavily on guest speakers in the field, as well as the factual information necessary to have a complete understanding of how Forensic Science is conducted.

## Course Standards:

The following is a list of NJSLS that describe what students are expected to know and be able to do as a result of successfully completing this course. The following NJSLS are the basis of the assessment of student achievement. The learner will demonstrate mastery of:

### **ELA/Literacy:**

- RST.6-8.2 - Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- RST.9-10.7 - Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- RST.11-12.1 - Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- WHST.6-8.2 - Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- WHST.6-8.9 - Draw evidence from informational texts to support analysis, reflection, and research.
- WHST.9-12.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

### **Math**

- MP.4 - Model with mathematics.
- HSN-Q.A.1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

- HSN-Q.A.2 - Define appropriate quantities for the purpose of descriptive modeling.
- HSN-Q.A.3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

## Next Generation Science Standards:

### **Science and Engineering Practices:**

#### **Asking Questions and Defining Problems**

- that arise from examining models or a theory, to clarify and/or seek additional information and relationships.
- Ask and/or evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set.

#### **Engaging in Argument from Evidence**

- Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)

#### **Developing and Using Models**

- Evaluate the merits and limitations of two different models of the same proposed tool, process, mechanism, or system in order to select or revise a model that best fits the evidence or design criteria.
- Design a test of a model to ascertain its reliability.

#### **Planning and Carrying Out Investigations**

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
- Select appropriate tools to collect, record, analyze, and evaluate data.

#### **Analyzing and Interpreting Data**

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.

#### **Constructing Explanations and Designing Solutions**

- Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.

#### **Engaging in Argument from Evidence**

- Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues.
- Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merits of arguments.
- Construct, use, and/or present an oral and written arguments or counterarguments based on data and evidence.

#### **Obtaining, Evaluating, and Communicating Information**

- Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

- Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.

### **Crosscutting Concepts:**

#### **Patterns**

- Empirical evidence is needed to identify patterns.

#### **Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

#### **Scale, Proportion, and Quantity**

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).

#### Connections to Nature of Science

##### **Science is a Human Endeavor**

- Technological advances have influenced the progress of science and science has influenced advances in technology.
- Science and engineering are influenced by society and society is influenced by science and engineering.

## **Scope and Sequence**

### **Unit 1 Introduction & Crime Scene**

1. To define forensic science or criminalistics
2. To recall the major contributors to the development of forensic science
3. To give examples of typical crime laboratories as they exist on the national, state, and local levels of government in the United States
4. To describe the services of a typical comprehensive crime laboratory in the criminal justice system
5. To explain the different approaches espoused by the *Frye and Daubert* decisions to the admissibility of scientific evidence in the courtroom
6. To explain the role and responsibilities of the expert witness
7. To review the proper collection and packaging of common types of physical evidence
8. To discuss the responsibilities of the first police officer who arrives at a crime scene
9. To explain the steps to be taken for thoroughly recording the crime scene
10. To describe the proper procedures for conducting a systematic search of crime scenes
11. To describe proper techniques for packaging common types of physical evidence
12. To explain chain of custody and its importance

## **Unit 2 Forensic Anthropology & Forensic Entomology**

1. To describe the skeletal differences between males and females
2. To describe the skeletal differences between infants, adolescents
3. , and aging adults
4. To describe the skeletal differences between the races
5. To describe the techniques used in estimating height from different bones
6. To explain how the research is carried out in Forensic Anthropology
7. To explain how insects are used to determine time of death
8. To describe the lifecycle of the Bow fly
9. To describe the sequence of insect arrival

## **Unit 3 Physical Evidence**

1. To list the common types of physical evidence encountered at crime scenes
2. To explain the differences between identification and comparison of physical evidence
3. To define individual and class characteristics
4. To give examples of physical evidence possessing these characteristics
5. To discuss the value of class evidence to a criminal investigation

## **Unit 4 Physical Properties: Glass and Soil**

1. To define refractive index
2. To distinguish between crystalline from amorphous solids
3. To describe the flotation and immersion methods for comparing glass specimens
4. To state how to examine glass fractures to determine the direction of impact for a projectile
5. To describe the proper collection of glass evidence
6. To list the important forensic properties of soil
7. To describe the proper collection of soil evidence as well as insect evidence

## **Unit 5 Hair, Fibers, and Paint**

1. To describe the cuticle, cortex, and medulla of hair
2. To explain the distinction between animal and human hairs
3. To list hair features that are useful for the comparison of human hairs
4. To explain the proper collection of hair evidence
5. To classify fibers
6. To describe the structure of a polymer
7. To list the properties of fibers that are most useful for forensic comparison
8. To describe the proper collection of fiber evidence
9. To describe the components of paint

10. To classify automobile paints
11. To list those examination most useful for performing a forensic comparison of paint
12. To describe the proper collection and preservation of paint evidence

### **Unit 6 Document and Voice Examination/Fingerprints**

1. To list some common individual characteristics associated with handwriting
2. To list some important guidelines to be followed for the collection of known writings for comparison to a questioned document
3. To describe the precautions to be taken to minimize deception when a suspect is requested to write exemplars for comparison to a questioned document
4. To list some of the class and individual characteristics of a typewriter
5. To describe the proper collection of typewritten exemplars
6. To list some of the techniques utilized by document examiners for uncovering alterations, erasures, obliterations, and variations in pen inks
7. To describe ridge characteristics
8. To explain why a fingerprint is a permanent feature of the human anatomy
9. To list the three major fingerprint patterns and their respective subclasses
10. To classify a set of fingerprints by the primary classification of the Henry system
11. To explain what's meant by visible, plastic, and latent fingerprints
12. To list the techniques for developing latent fingerprints on non-porous objects
13. To describe chemical techniques for developing prints on porous objects
14. To describe the proper procedures for preserving a developed latent fingerprint

### **Unit 7 Firearms, Toolmarks, and Other Impressions; Serial Killer Case Studies**

1. To describe techniques for rifling a barrel
2. To list the class and individual characteristics of bullets and cartridge cases
3. To explain the utilization of the comparison microscope for the comparison of 4. bullets and cartridge cases
4. To distinguish caliber from gauge
5. To explain the procedure for determining the distance from a target a weapon was fired
6. To describe the laboratory tests utilized for determining whether an individual has fired a weapon and inform of the limitations
7. To explain why it may be possible to restore an obliterated serial number
8. To list procedures for the proper collection and preservation of firearm evidence
9. To explain how a suspect tool is compared to a tool mark
10. To explain the forensic significance of class and individual characteristics to the comparison of impressions

### **Unit 8 Forensic Toxicology**

1. To define psychological and physical dependence
2. To name and classify the commonly abused drugs

3. To describe the tendency to develop psychological and physical dependency for the more commonly abused drugs
4. To explain how alcohol is absorbed into the bloodstream, transported throughout the body, and finally eliminated by oxidation and excretion
5. To name the important parts of the human circulatory system
6. To describe the process by which alcohol is excreted in the breath via the alveoli sacs
7. To describe the design of the Breathalyzer
8. To explain the significance of a chemical equation as related to breath-testing devices
9. To explain the concept of an infrared breath-testing devices
10. To demonstrate some common field sobriety tests
11. To list common laboratory procedures for measuring alcohol's concentration in the blood
12. To develop an appreciation for the role of the toxicologist in the criminal justice system
13. To describe some of the techniques that forensic toxicologists use for isolating and identifying drugs and poisons
14. To discuss the significance of finding a drug in human tissues and organs

### **Unit 9 Forensic Serology and DNA/OJ Simpson Case**

1. To list the A-B-O antigens and antibodies found in the blood for each of the four blood types: A, B, AB, O
2. To explain why agglutination occurs
3. To explain how whole blood is types
4. To describe tests used to characterize a stain as blood
5. To explain the significance of the precipitin test to forensic serology
6. To describe the absorption-elution technique
7. To define a secretor and explain the significance to forensic serology
8. To describe how the existence of polymorphic enzymes and proteins contributes to blood's individualization
9. To list the necessary procedures to be taken for the proper preservation of bloodstained evidence for laboratory analysis
10. To define chromosome and gene
11. To know how the Punnet Square is used to determine the genotypes and phenotypes of offspring
12. To list the laboratory tests necessary to characterize seminal stains
13. To explain how suspect stains are to be properly preserved for laboratory examination
14. To describe the collection of physical evidence related to a rape investigation

## **Assessments**

Evaluation of student achievement in this course will be based on the following:

- a. Observational data collected by teachers as students are learning
- b. Formative assessments given by teachers to gauge progress toward each standard

## Curriculum Resources

1. Firing Range
2. Laboratory equipment
3. Lifting tape
4. Hair labs
5. Fiber labs
6. CSI episodes
7. Webquest
8. Glass Fracture labs
9. Soil Labs
10. Physical Evidence Lab 1: Individual vs. Class characteristics
11. Physical Evidence Lab 2: Identification vs. Comparison
12. Jon-Benet Ramsey Case
13. Fly Witness Lab
14. Forensic Entomology Video
15. Webquest: Insect timeline
16. Entomology Test
17. Body Measurements Lab
18. Body Farm video
19. Forensic Anthropology video
20. Skull measurements/Hip measurement
21. Bone Bonanza Lab/3 Small Bones Lab
22. Conduct and systematic search for evidence
  - a. Collect and package physical evidence
  - b. Maintain chain of custody
  - c. Obtain controls
  - d. Submit evidence to the laboratory
  - e. Crime scene safety
23. Processing the crime scene
  - a. secure and isolate the crime scene
  - b. record the scene
    - 1) photography
    - 2) sketching
    - 3) notes
  - 4) Conduct and systematic search for evidence

## Home and School Connection

<http://www.syracusebiotechnology.com/forensics-unit-1-intro-to-forensics/>

[https://www.pbs.org/wgbh/nova/education/resources/subj\\_04\\_03.html](https://www.pbs.org/wgbh/nova/education/resources/subj_04_03.html)

<https://www.nsta.org/enewsletter/2003-03/member.htm>

<http://www.discoveryeducation.com/teachers/free-lesson-plans/the-science-of-forensics.cfm>