Glendale Unified School District

High School

May 1, 2018

Department:	Career Technical Education / Science
Course Title:	Forensic Science 1-2
Course Code:	7095V/7096V
Grade Level(s):	10-12
School(s) Course Offered:	Hoover High School
UC/CSU Approved (Y/N, Subject):	Pending, Laboratory Science "d"
Course Credits:	10
Required Prerequisite:	Biology
Recommended Prerequisite:	MS Intro to Forensics, Chemistry
Recommended Textbook:	Forensic Science Fundamentals and Investigations by Anthony J. Bertino, (2012) publisher: Southwestern Cengage Learning
Course Overview:	In this course students study biology and earth science by engaging in investigations of how scientific evidence is used to solve crimes. Students take on the roles of public safety professionals to identify, collect, preserve, test, and analyze physical evidence. Each unit of this course asks how physical evidence can be used to solve a type of crime, and students explain and explore the scientific principles at work. Students learn not only how

and why evidence can be used to solve crime, but also how bio geological processes affect the preservation and viability of physical evidence. Professional report writing is emphasized in this course, reflecting the high frequency and importance of writing reports in public safety careers. Throughout this course, students will collect and analyze evidence from simulated crime scenes. The course culminates with students using physical evidence to solve a simulated homicide and delivering expert testimony in a simulated murder trial.

This course content will cover a wide range of topics pertaining to forensic science. From the careers available, to the procedures needed when approaching a crime scene, to observational skills, analyzing the various types of evidence, firearms, ballistics, fingerprints, fibers, DNA, etc. Students will have a firm understanding of the importance of science in helping solve crimes of all sorts: murder, burglary, counterfeiting, etc. and they will have the opportunity to practice and develop their skills through the use of labs, forensic technology, reading and processing case studies, writing lab reports, working through project based lessons and assessments. Students will be grappling with real world problems as they use the skills they develop in forensic science to better understand and solve many of these inquiries. All lessons and assessments connect directly to the Next Generation Science Standards.

First Semester-Course Content

Unit 1: **Observation, Investigation & Evidence Collection** (2 weeks)

STANDARDS
New Generation Science Standards: HS-PS1-1, HS-PS1-2, HS-PS1-3, HS-PS1-5, HS-PS2-5, HS-PS3-4, HS-LS1-3, HS-ESS2-5, SEP.SIUVM.S, DCI.ETS1.A.A
CTE Public Service: PS.A.2.7, PS.B.3.7, PS.B.B4.1, CTE.PS.A.6.10, CTE.PS.C.C1.1, HSMT.B.7.1
CCSS: ELA.9-10.R.CAGT.2.5, RST.9-10.1, RST.9-10.3, RST.11-12.3, HSN.Q.A.1

A. Students will be able define forensic science, define observation, and describe what changes occur in the brain while observing. They will also describe examples of factors influencing eyewitness accounts of events as well as compare the reliability of eyewitness testimony to what actually happened. They will also relate observation skills to their use in forensic science. Students will also practice

and improve their own observation skills. Students will summarize Locard's Principle of exchange as well as identify at least four examples of trace evidence. They will be able to distinguish between direct and circumstantial evidence. They will summarize the seven steps of crime scene investigation and explain the importance of securing a crime scene. They will also demonstrate proper technique in collecting and packaging trace evidence. Students will also explain what it means to map a crime scene and describe how evidence from a crime scene is analyzed.

B. Simulated crime scenes will be set up before students come to class. Students will process the crime scene collecting evidence, processing and logging each item, and making observations that could determine what happened at the scene.

Unit 2: **Scientific Methodology** (2 weeks)

STANDARDS
NGSS: SEP.AQDP.AK.E, SEP.AQDP.AK.A, SEP.SIUVM.S, SEP.SKORLNE.M, CC.P.D
CTE Public Service: CTE.PS.C.9.6, PS.C.9.13, CTE.PS.C.C1.1, CTE.PS.C.C1.6, CTE.PS.KPAS.5.4,
CCSS: ELA.9-10.LS.2.3a, ELA.9-10.R.CAGT.2.5, RST.11-12.8, WHST.11-12.2, SL.7.1

A. Students will be learn to use the scientific method in the crime scene investigation process. They will be able to make prediction and observe outcomes to identify logical outcomes. They will also create a theory that leads to hypothesis that they will use to provide confirmation of the evidence collected at a crime scene.

B. Students are given a crime case, with evidence and investigation information, they must analyze these items and discover what needs to be used to support a claim. Students will work in groups predict and to come to consensus what the evidence and investigation shows. They will make their claims of the logical outcome and give their reasoning.

Unit 3: **Safety** (1 week)

STANDARDS
NGSS: Appendix D
CTE Public Service: CTE.PS.6.0, CTE.PS.C.C1.1, CTE.PS.C.C1.6

A. Students will learn the proper use of lab equipment as well as the proper safety procedures to follow in case of an emergency. They will also be able identify and label all safety apparatus including emergency response instructions. Students will learn about CPR and first aid as well as first responder actions and responsibilities. Students will understand Material Safety Data Sheets and be able to identify where it can be found as well as the importance of the information related to various emergency scenarios.

B. Students will be given various scenarios regarding safety and emergency situations. They will have a specific amount of time to complete the various scenarios.

Unit 4: **Death and Incident Processing** (4 weeks)

STANDARDS
NGSS: HS-LS1- 1, HS-LS1-2, SEP.AID.AK.A, HS-LS2-1,
CTE Public Service: CTE.PS.A.6.10, CTE.PS.C.C1.1, CTE.PS.KPAS.5.1, CTE.PS.KPAS.10.1, CTE.PS.C.C1.6
CCSS: ELA.9-10.W.2.6b, SL.9-10.2,

A. Students will learn the protocol to processing a crime scene. They will also know the responsibilities of each member of a task force in charge of processing a crime scene. They will understand how to set up a command post and how to follow the chain of command established. Students will also learn how to process evidence and the importance of documentation and chain of custody in regards to maintaining the integrity of the evidence processed. Students will also describe various parts of a hair. They will also be able to describe variations in the structure of the medulla, cortex, and cuticle. They will be able to distinguish between a human and nonhuman animal hair. Students will be able to explain how hair can be used in a forensic investigation.

B. Students will be divided into groups of 3-4. Students will be working with knowledge gained in this unit about calculating time of death. Each group will be given a set of at least 5 different scenarios involving death. In each scenario a different amount of time will have passed since death. Groups will match up each scenario with the most accurate method of estimating time of death.

Unit 5: **Microscopy and Trace Evidence** (4 weeks)

STANDARDS
NGSS: HS-LS1-1, HS-LS4-2, SEP.PCOI.PK.P
CTE Public Service: CTE.PS.C.9.6, CTE.PS.C.C1.1, CTE.PS.C.C1.6
CCSS: RST-11.12.8, WHST.9-12.5, RI.4.1

A. Students will learn about the different types of trace evidence and how to analyze that evidence including how to link it to a crime scene. Students will learn about soils, types of plants and pollens, spores and how to process and analyze them. They will move on to hair and different fibers and how they collect and process those.
B. Students will work with hair and other trace evidence. Using a microscope students will analyze the different hair and fibers samples and other small but measurable evidence that was collected at a crime scene. The task is to try to match the hair evidence that was collected at the crime scene with hair that was collected from four suspects.

Unit 6: **Fingerprints** (4 weeks)

STANDARDS
NGSS: HS-ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS1-1, HS-LS1-2, HS-LS3-1, HS-LS3-3, HS-LS4-1, HS-LS4-2, SEP.SIUVM.S, SEP.PCOI.PK.P
CTE Public Service: CTE.PS.C.C1.1, CTE.PS.C.C1.6
CCSS: RST-11.12.1, RST-11.12.8, WHST.9-12.5

A. Students will be outline the history of fingerprinting. They will also be able to describe the characteristics of fingerprints as well as compare and contrast the basic types of fingerprints. They will also be able to describe the latest identification techniques. Students will also describe how criminals attempt to alter their fingerprint and how law enforcement process those types of prints. Students will be able to transfer their understanding of dactylography so that on

their own, they will be able to cite evidence of how to identify and analyze the three general fingerprint patterns, and assess the minutiae found in fingerprints in order to prove a positive match.

B. Students will analyze a crime scene in which fingerprints were left behind. They will compare different fingerprints, including their own to determine which prints are matched and which are not using control samples and the samples taken from the crime scene.

Second Semester-Course Content

Unit 7: **DNA Evidence, Blood and Blood spatter** (4 weeks)

STANDARDS
NGSS: HS-LS1-1, HS-LS1-2, HS-ETS1-1, HS-ETS1-2, HS-LS3-1, HS-LS3-2, HS-LS3-3, DCI.PS1.B.W, DCI.LS3.B.D, SEP.SIUVM.S, SEP.SIUVM.N, SEP.PCOI.PK.P
CACS: S.9-12.LS.5.a
CTE Public Service: CTE.PS.B.3.10, CTE.PS.C.C1.1, CTE.PS.C.C9.1, CTE.PS.C.C1.6
CCSS: M.7.MG.3.3, M.7.MG.3.2, ELA.9-10.R.CAGT.2.5, M.5.MG.2.1, ELA.9-10.R.CAGT.2.3

A. Students will describe the forensic significance of the different types of blood cells. They will also summarize the history of the use of blood and blood-spatter analysis in forensics. Students will also describe the proper procedure for handling blood evidence. They will also outline the procedure used to determine blood type and describe how to screen for the presence of human blood. They will also be able to calculate the probability of a person having a specific blood type using data from population studies.

B. 1) Students are presented with a scenario where blood was the only evidence left at the scene of a crime. Working with a lab partner, students will determine who the culprit is by narrowing down a field of possible suspects. Students will test the blood evidence against blood samples from the possible suspects. Students will carry out a blood typing test to narrow down the field followed by gel electrophoresis to make a determination as to who the actual criminal was. 2) Students will discover how Blood Evidence can be used for Crime Solving in a scenario where a car was broken into in the school parking lot, and although no fingerprints or hair was found, the burglar cut himself on the broken glass and left

behind blood evidence. Prior to completing this activity. 3) The DNA matches the crime to a person who is an identical twin. Students will need to look at the structure of DNA and determine why DNA is not the best evidence to use when identical twins are suspects in a crime.

Unit 8: **Drug identification and toxicology** (3 weeks)

STANDARDS
NGSS: HS-PS1-1, HS-PS1-2, HS-PS1-5, HS-PS1-6, HS-LS1-2, HS-LS1-3, DCI.PS1.B.W, SEP.AQDP.AK.E, SEP.CEDS.CK.C
CTE Public Service: CTE.PS.B.3.10, CTE.PS.C.C1.1
CCSS: RST.9-10.3, ELA.9-10.R.CAGT.2.5, RST.9-10.3

A. Students will start with learning a brief history of drug identification and toxicology including what exactly toxicology entails. Students will then learn about different types of drugs with an emphasis on controlled substances. This will include characteristics of the drug, identification of the drug, and signs and symptoms the drug may give to the victim. Finally, students will learn how different drugs affect the human body, the physiological effects and why people may be more sensitive.

B. Students will work in pairs to create a table which details information about common street drugs including the name and category. Each pair will create a pocket-sized quick reference guide that law enforcement could use to assess an individual and determine what drug they are most likely under the influence of and present them to a law enforcement officer.

Unit 9: **Forensic Entomology** (4 weeks)

STANDARDS
NGSS: HS-LS1- 1, HS-LS1-2, SEP.PCOI.PK.P, SEP.CEDS.CK.C
CTE Public Service: CTE.PS.B.3.10, CTE.PS.C.C1.1
CCSS: ELA.9-10.R.CAGT.2.5

A. Students will describe several examples of the ways that forensic entomology is used to help solve crimes. They will compare and contrast the four stages of

blowfly metamorphosis, and describe the significance of blowflies in forensic entomology. They will also describe the function of each of the following organs on blowflies and explain the significance of each structure ot forensic entomology: spiracles, mouth hooks, and crop. Students will also describe the different environmental factors on insect development. They will also describe the five stages of decomposition. Students will also explain how forensic entomologist interpret forensic evidence and environmental conditions to estimate postmortem interval.

B. Students will have to figure out the most likely order of arrival of different flies and beetles to a simulated decomposing body at various stages and match them up.

Unit 10: **Handwriting analysis, forgery and counterfeiting** (3 weeks)

STANDARDS
NGSS: HS-ETS1-1, HS ETS1-3. CCLS, RST.11-12.4, RST.11-12.7, RST.11-12.8, RST.11-12.9, WHST.11-12.5
CTE Public Service: CTE.PS.B.3.10, CTE.PS.C.C1.1
CCSS: ELA.9-10.R.CAGT.2.5

A. This unit is designed to address the fundamental aspects of document examination as it applies to forensic science. Students will explore handwriting analysis as well as some guidelines for collecting known writings for comparison to a questioned document. Students will also discuss some of the class and individual characteristics of printers, photocopiers, inks. Students will use document examination techniques to uncover alterations, erasures, obliterations, and variations in pen inks. Students will familiarize themselves with US currency security features and identify counterfeit currency. Students will be able to explain how a sample of handwriting evidence is compared with and exemplar using both qualitative and quantitative characteristics. They will also be able to describe some of the limitations of handwriting analysis. Students will also be able to identify a historical case of document fraud and explain how the fraudulent document was created. Students will also be able to describe recent developments in technology for use in handwriting analysis. They will also list and describe several ways in which businesses prevent check forgery. Students will also be able to describe features of new paper currency that protect against counterfeiting. They will also

compare and contrast older paper currencies with new currencies, including those on plastic stock.

B. Students will be given different documents to analyze the characteristics of handwriting. They will need to determine which are the originals and which have been forged.

Unit 11: **Physical Evidence and Tool Marks** (3 weeks)

STANDARDS
NGSS: HS-LS1- 1, HS-LS1-2, HS-LS2-7, HS-PS4-1
CTE Public Service: CTE.PS.B.3.10, CTE.PS.C.C1.1
CCSS: ELA.9-10.R.CAGT.2.5

A. Forensic science utilizes all levels of scientific inquiry, specifically chemistry and physics, to analyze physical evidence with the ultimate goal of recreating the events of the crime for a jury in a court of law. Students will also identify and compare various types of physical evidence and compare their values to forensic investigation. Students will address the fundamental aspects of crime scene investigation and the identification and comparison of physical evidence. Students will be able to define physical evidence and describe how it is collected and packaged as well as identify and compare various types of physical evidence and compare their values to forensic investigation. Understand the importance of following the principals of scientific method and the need for collecting control samples at every crime scene. Students will be able to describe how forensic investigators analyze evidence made from tool marks as well as providing well supported arguments on what is considered class evidence. They will also compare and contrast soda glass, lead glass, and heat-resistant glass. They will be able to distinguish between radial and concentric fractures and identify how they are formed.

B. Students will examine the impressions left on a lock and chain link fence to determine what type of object was used to break into the school. Physical evidence must be collected in a specific and strategic manner, as well as systematically documented, in order to ensure that no tampering or contamination occurs. Physical evidence can link specific persons or objects to a crime scene, or may contain class characteristics linking a type of object to a crime scene. Physical

evidence collected from crime scenes (i.e. fingerprints and DNA) are shared on national databases. This dramatically enhances the role of forensic science in criminal investigation.

Unit 12: **Firearms and ballistics** (2 weeks)

STANDARDS
NGSS: HS-ETS1- 2, HS-PS1- 2, HS-LS1- 3, HS-LS1- 1, HS-LS1 6,HSLS2-3
CTE Public Service: CTE.PS.B.3.10, CTE.PS.C.C1.1,
CCSS: ELA.9-10.R.CAGT.2.5, RST.9-10.3

A. Students will be able to compare and contrast the different types of firearms, including handguns, rifles, and shotguns. They will be able to put in order the sequence of events that result in a firearm discharge and estimate the trajectory of a projectile. Students will also analyze the composition and formation of gunshot residue and its reliability as a source of evidence. They will also compare and contrast entrance and exit wounds, including size, shape, gunshot residue, and the presence of burns. Students will be able to distinguish among the various forms of firearm evidence, including rifling, markings on cartridges, marks on projectiles, and gunshot residue. They will also process/ or analyze a crime scene for firearm ballistics evidence.

B. Students will learn background information on different types of firearms, and how a ballistics expert might use that knowledge to assist in crime scene investigations. Students will obtain metric data, analyze bullet caliber, and use tools to analyze a “bullet hole”.