Cluster:	**Law, Public Safety, Corrections, and Security**		
Course Name:	**Forensic Science (One Credit)**		
Course Description:	(1) Forensic Science. Forensic Science is a course that uses a structured and scientific approach to the investigation of crimes of assault, abuse and neglect, domestic violence, accidental death, homicide, and the psychology of criminal behavior. Students will learn terminology and investigative procedures related to crime scene, questioning, interviewing, criminal behavior characteristics, truth detection, and scientific procedures used to solve crimes. Using scientific methods, students will collect and analyze evidence through case studies and simulated crime scenes such as fingerprint analysis, ballistics, and blood spatter analysis. Students will learn the history, legal aspects, and career options for forensic science. (2) Nature of science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable. (3) Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation can be experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked. (4) Science and social ethics. Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scientific decision-making methods and ethical and social decisions that involve the application of scientific information. (5) Scientific systems. A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.		
Course Requirements:	The course is recommended for students in Grades 11-12. Prerequisites: Biology and Chemistry. Recommended prerequisites: Principles of Law, Public Safety, Corrections, and Security and Law Enforcement I. To receive credit in science, students must meet the 40% laboratory and fieldwork requirement.		
Course Equipment:	Required materials: stereomicroscope, compound microscope, microscope accessories, UV light source, magnifying glass, general laboratory equipment, fingerprinting supplies, general evidence collection supplies		
Units of Study	**Knowledge and Skills**	**Student Expectations**	**Resources**
I. Safety & Scientific Method			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during laboratory and field investigations;	OSHA General Chemistry textbooks
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;	

Units of Study	Knowledge and Skills	Student Expectations	Resources
		(B) know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;	
		(C) know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;	
		(D) distinguish between scientific hypotheses and scientific theories;	
		(E) plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;	
		(C) draw inferences based on data related to promotional materials for products and services;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(6) The student analyzes the evidence collected from a crime scene using scientific methods. The student is expected to:	(A) demonstrate conversions of measurements between English and International System (SI) of units;	
		(B) distinguish between physical and chemical properties of matter using the periodic table;	
		(C) determine the elements within a compound or mixture;	
		(D) identify the four types of chemical reactions;	
II. History			
	(4) The student explores the history, legal responsibilities, and career options for forensic science. The student is expected to:	(A) distinguish between forensic science and criminalistics in law, public safety, corrections, and security;	BERTINO CRIMINALISTICS FSI
		(B) identify roles, functions, and responsibilities of forensic science professionals;	
		(C) summarize the ethical standards required of a forensic science professional;	
		(D) present career information in written and verbal formats;	
		(E) recognize the major contributors to the development of forensic science; and	
		(F) illustrate the history of forensic science.	
	(5) The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene. The student is expected to:	(A) analyze the role of scientists such as forensic pathologists and anthropologists as they relate to a homicide investigation;	
III. Legal Systems			
	(4) The student explores the history, legal responsibilities, and career options for forensic science. The student is expected to:	(A) distinguish between forensic science and criminalistics in law, public safety, corrections, and security;	BERTINO CRIMINALISTICS FSI FSH1
		(B) identify roles, functions, and responsibilities of forensic science professionals;	
		(C) summarize the ethical standards required of a forensic science professional;	
	(5) The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene. The student is expected to:	(D) apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence;	
		(G) outline the chain of custody procedure for evidence discovered in a crime scene;	
IV. Crime Scene Investigation			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	CRIMINALISTICS FSI BERTINO FISHER
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	

Units of Study	Knowledge and Skills	Student Expectations	Resources
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, metersticks, and models, diagrams, or samples of biological specimens or structures;	
		(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;	
		(C) draw inferences based on data related to promotional materials for products and services;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(5) The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene. The student is expected to:	(A) analyze the role of scientists such as forensic pathologists and anthropologists as they relate to a homicide investigation;	
		(B) demonstrate the ability to work as a member of a team;	
		(C) conduct a systematic search of a simulated crime scene for physical evidence following crime scene protocol;	
		(D) apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence;	
		(E) describe the elements of a crime scene sketch such as measurements, compass directions, scale of proportion, legend, key, and title;	
		(F) develop a crime scene sketch using triangulation, rectangular coordinates, straight-line methods, and use of coordinates on transecting baseline;	
		(G) outline the chain of custody procedure for evidence discovered in a crime scene;	
		(H) demonstrate proper techniques for collecting and packaging physical evidence found at a crime scene;	
		(I) explain the functions of national databases available to forensic scientists; and	
		(J) collect and preserve physical evidence from a simulated crime scene.	
	(6) The student analyzes the evidence collected from a crime scene using scientific methods. The student is expected to:	(A) demonstrate conversions of measurements between English and International System (SI) of units;	
V. Forensic Glass Analysis			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	CRIMINALISTICS FSI FSH1 BERTINO FISHER GLASS
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	

Units of Study	Knowledge and Skills	Student Expectations	Resources
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, meter sticks, and models, diagrams, or samples of biological specimens or structures;	
		(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(6) The student analyzes the evidence collected from a crime scene using scientific methods. The student is expected to:	(A) demonstrate conversions of measurements between English and International System (SI) of units;	
		(B) distinguish between physical and chemical properties of matter using the periodic table;	
		(C) determine the elements within a compound or mixture;	
		(D) identify the four types of chemical reactions;	
		(E) explain properties of refractive index;	
		(F) explain dispersion of light through a prism;	
		(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope;	
		(I) calculate the direction of a projectile by examining glass fractures; and	
		(J) compare the composition of glass fragments.	
	(7) The student recognizes the methods to process and analyze trace evidence commonly found in a crime scene. The student is expected to:	(B) process trace evidence such as soil, grass, glass, blood, fibers, and hair collected in a simulated crime scene;	
VI. Forensic Hair & Fiber Analysis			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	FISHER FSH1 FSH2 FSI BERTINO CRIMINALISTICS TRACE HAIR FIBER
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, metersticks, and models, diagrams, or samples of biological specimens or structures;	
		(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	

Units of Study	Knowledge and Skills	Student Expectations	Resources
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(6) The student analyzes the evidence collected from a crime scene using scientific methods. The student is expected to:	(A) demonstrate conversions of measurements between English and International System (SI) of units;	
		(B) distinguish between physical and chemical properties of matter using the periodic table;	
		(C) determine the elements within a compound or mixture;	
		(D) identify the four types of chemical reactions;	
		(E) explain properties of refractive index;	
		(F) explain dispersion of light through a prism;	
		(G) identify the light sources used in forensic science such as ultraviolet light;	
		(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope;	
	(7) The student recognizes the methods to process and analyze trace evidence commonly found in a crime scene. The student is expected to:	(A) perform continuous and light emissions laboratory procedures to identify trace evidence;	
		(B) process trace evidence such as soil, grass, glass, blood, fibers, and hair collected in a simulated crime scene;	
		(C) compare the anatomy of the human hair to animal hair; and	
		(D) differentiate between natural and manufactured fibers.	
VII. Paint			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	FISHER FSH1 FSH2 FSI BERTINO CRIMINALISTICS TRACE PAINT
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, metersticks, and models, diagrams, or samples of biological specimens or structures;	
		(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(5) The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene. The student is expected to:	(C) conduct a systematic search of a simulated crime scene for physical evidence following crime scene protocol;	
		(E) describe the elements of a crime scene sketch such as measurements, compass directions, scale of proportion, legend, key, and title;	
		(F) develop a crime scene sketch using triangulation, rectangular coordinates, straight-line methods, and use of coordinates on transecting baseline;	
		(G) outline the chain of custody procedure for evidence discovered in a crime scene;	

Units of Study	Knowledge and Skills	Student Expectations	Resources
		(H) demonstrate proper techniques for collecting and packaging physical evidence found at a crime scene;	
		(I) explain the functions of national databases available to forensic scientists; and	
		(J) collect and preserve physical evidence from a simulated crime scene.	
	(6) The student analyzes the evidence collected from a crime scene using scientific methods. The student is expected to:	(A) demonstrate conversions of measurements between English and International System (SI) of units;	
		(B) distinguish between physical and chemical properties of matter using the periodic table;	
		(C) determine the elements within a compound or mixture;	
		(D) identify the four types of chemical reactions;	
		(G) identify the light sources used in forensic science such as ultraviolet light;	
		(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope;	
	(7) The student recognizes the methods to process and analyze trace evidence commonly found in a crime scene. The student is expected to:	(A) perform continuous and light emissions laboratory procedures to identify trace evidence;	
VIII. Footwear & Tire Impressions			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	FISHER FSI BERTINO CRIMINALISTICS
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, metersticks, and models, diagrams, or samples of biological specimens or structures;	
		(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(5) The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene. The student is expected to:	(C) conduct a systematic search of a simulated crime scene for physical evidence following crime scene protocol;	
		(D) apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence;	
		(E) describe the elements of a crime scene sketch such as measurements, compass directions, scale of proportion, legend, key, and title;	
		(G) outline the chain of custody procedure for evidence discovered in a crime scene;	
		(H) demonstrate proper techniques for collecting and packaging physical evidence found at a crime scene;	
		(I) explain the functions of national databases available to forensic scientists; and	
		(J) collect and preserve physical evidence from a simulated crime scene.	
	(6) The student analyzes the evidence collected from a crime scene using scientific methods. The student is expected to:	(A) demonstrate conversions of measurements between English and International System (SI) of units;	
		(G) identify the light sources used in forensic science such as ultraviolet light;	

Units of Study	Knowledge and Skills	Student Expectations	Resources
IX. Fingerprints			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	COOK DUKE BERTINO FSI FISHER CRIMINALISTICS IAI SWGFAST
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, metersticks, and models, diagrams, or samples of biological specimens or structures;	
		(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(8) The student analyzes fingerprints in forensic science. The student is expected to:	(A) compare the three major fingerprint patterns of arches, loops, and whorls and their respective subclasses;	
		(B) identify characteristics of fingerprints, including bifurcations, ending ridges, ridge islands, dots, short ridges, and divergence ridges;	
		(C) distinguish among visible, plastic, and latent fingerprints;	
		(D) perform laboratory procedures for lifting latent prints on porous and nonporous objects using chemicals such as iodine, ninhydrin, silver nitrate, and cyanoacrylate resin;	
		(E) perform laboratory procedures for lifting latent prints on nonporous objects using fingerprint powders such as black powder and florescent powders;	
		(F) explain the Automatic Fingerprint Identification System; and	
		(G) compare fingerprints collected at a simulated crime scene with the fingerprints of a suspect.	
X. Forensic Serology/DNA			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	FISHER FSH1 FSH2 FSI BERTINO CRIMINALISTICS DNA NFSTC DNA
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, metersticks, and models, diagrams, or samples of biological specimens or structures;	
		(G) analyze, evaluate, make inferences, and predict trends from data; and	

Units of Study	Knowledge and Skills	Student Expectations	Resources
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(7) The student recognizes the methods to process and analyze trace evidence commonly found in a crime scene.	(B) process trace evidence such as soil, grass, glass, blood, fibers, and hair collected in a simulated crime scene;	
	(9) The student analyzes blood spatter at a simulated crime scene. The student is expected to:	(A) analyze blood stain patterns based on source, direction, and angle of trajectory; and	
		(B) explain the method of chemically isolating an invisible blood stain, using reagents such as luminol.	
	(11) The student explores serology laboratory procedures in forensic science. The student is expected to:	(A) explain forensic laboratory procedures to determine if a stain detected in a crime scene is blood;	
		(B) identify the red blood cell antigens and antibodies as they relate to human blood types;	
		(C) determine genotypes and phenotypes in the human red blood cell system using Punnet Squares; and	
		(D) research methodologies used to collect and analyze other body fluids.	
	(12) The student analyzes deoxyribonucleic acid laboratory procedures in forensic science. The student is expected to:	(A) diagram the deoxyribonucleic acid molecule, including nitrogen bases, sugars, and phosphate groups;	
		(B) explain base pairing of adenine, thymine, cytosine, and guanine as they relate to deoxyribonucleic acid fingerprinting;	
		(C) extract deoxyribonucleic acid from food such as peas and strawberries;	
		(D) explain the polymerase chain reaction laboratory procedure for forensic deoxyribonucleic acid typing; and	
		(E) collect and package deoxyribonucleic acid from a simulated crime scene.	
XI. Forensic Toxicology			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	FISHER FSH1 FSI BERTINO CRIMINALISTICS TOX
		(B) apply wise choices in the use and conservation of resources and the disposal or recycling of materials	
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, metersticks, and models, diagrams, or samples of biological specimens or structures;	
		(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(6) The student analyzes the evidence collected from a	(A) demonstrate conversions of measurements between English and International System (SI)	

Units of Study	Knowledge and Skills	Student Expectations	Resources
	crime scene using scientific methods. The student is expected to:	of units;	
		(B) distinguish between physical and chemical properties of matter using the periodic table;	
		(C) determine the elements within a compound or mixture;	
		(D) identify the four types of chemical reactions;	
	(10) The student explores toxicology laboratory procedures in forensic science. The student is expected to:	(A) explain the absorption, distribution, and elimination of alcohol through the human body;	
		(B) describe the blood alcohol laboratory procedures as they relate to blood alcohol concentration;	
		(C) explain the levels of tolerance and impairment due alcohol consumption; and	
		(D) explain the precautions necessary in the forensic laboratory for proper preservation of blood samples.	
XII. Controlled Substances			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	FISHER FSH1 FSH2 FSI BERTINO CRIMINALISTICS DRUG
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, metersticks, and models, diagrams, or samples of biological specimens or structures;	
		(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;	
		(C) draw inferences based on data related to promotional materials for products and services;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(6) The student analyzes the evidence collected from a crime scene using scientific methods. The student is expected to:	(A) demonstrate conversions of measurements between English and International System (SI) of units;	
		(B) distinguish between physical and chemical properties of matter using the periodic table;	
		(C) determine the elements within a compound or mixture;	
		(D) identify the four types of chemical reactions;	
		(G) identify the light sources used in forensic science such as ultraviolet light;	
		(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope;	
	(13) The student identifies drugs found at a simulated crime scene. The student is expected to:	(A) classify controlled substances using Food and Drug Administration classification; and	
		(B) identify controlled substances using laboratory procedures such as color test reactions, microcrystalline procedures, chromatography, and spectrophotometry.	

Units of Study	Knowledge and Skills	Student Expectations	Resources
XIII. Questioned Documents			
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(G) analyze, evaluate, make inferences, and predict trends from data; and	FISHER FSH1 FSI BERTINO CRIMINALISTICS AFDE
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;	
		(C) draw inferences based on data related to promotional materials for products and services;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(5) The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene. The student is expected to:	(C) conduct a systematic search of a simulated crime scene for physical evidence following crime scene protocol;	
		(D) apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence;	
		(G) outline the chain of custody procedure for evidence discovered in a crime scene;	
		(H) demonstrate proper techniques for collecting and packaging physical evidence found at a crime scene;	
		(I) explain the functions of national databases available to forensic scientists; and	
		(J) collect and preserve physical evidence from a simulated crime scene.	
	(6) The student analyzes the evidence collected from a crime scene using scientific methods. The student is expected to:	(B) distinguish between physical and chemical properties of matter using the periodic table;	
		(C) determine the elements within a compound or mixture;	
		(G) identify the light sources used in forensic science such as ultraviolet light;	
		(H) explain the examination of trace evidence using instruments such as a spectrophotometer, stereoscope, electron microscope, and compound microscope;	
	(7) The student recognizes the methods to process and analyze trace evidence commonly found in a crime scene. The student is expected to:	(A) perform continuous and light emissions laboratory procedures to identify trace evidence;	
		(B) process trace evidence such as soil, grass, glass, blood, fibers, and hair collected in a simulated crime scene;	
		(D) differentiate between natural and manufactured fibers.	
IXV. Firearms & Toolmarks			
	(1) The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:	(A) demonstrate safe practices during field and laboratory investigations;	FISHER FSH1 FSH2 FSI BERTINO CRIMINALISTICS AFTE SWGGUN
		(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	

Units of Study	Knowledge and Skills	Student Expectations	Resources
		(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;	
		(C) draw inferences based on data related to promotional materials for products and services;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(F) research and describe the history of science and the contributions made by scientists	
	(14) The student evaluates bullet and tool mark impressions in a criminal investigation. The student is expected to:	(A) explain the individual characteristics of tool marks;	
		(B) recognize characteristics of bullet and cartridge cases;	
		(C) explain laboratory methodologies used to determine whether an individual has fired a weapon such as identifying gun shot residue; and	
		(D) recognize the type of information available through the National Integrated Ballistics Information Network.	
XV. Forensic Anthropology			
	(2) The student uses scientific methods and equipment during field and laboratory investigations. The student is expected to:	(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, metersticks, and models, diagrams, or samples of biological specimens or structures;	BERTINO FISHER
		(G) analyze, evaluate, make inferences, and predict trends from data; and	
		(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	
	(3) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
		(D) evaluate the impact of research on scientific thought, society, and the environment;	
		(E) evaluate models according to their limitations in representing biological objects or events	
		(F) research and describe the history of science and the contributions made by scientists	
	(15) The student explores principles of anthropology relevant to forensic science. The student is expected to:	(A) identify the major bones of the human skeletal system;	
		(B) compare composition and structure of human bones with other animals;	
		(C) describe the techniques used to excavate bones from a crime scene;	
		(D) determine unique characteristics of the human skeletal system such as gender and age;	
		(E) explain the role of dental records in identification of remains; and	
		(F) describe the role of dental matching in forensic science.	
	(16) The student calculates the time and cause of death in relationship to decomposition of the human body. The student is expected to:	(A) explain the process and timeline of rigor mortis and its role in calculating time of death;	
		(B) explain post mortem lividity and its importance when processing a crime scene;	
		(C) determine time of death using entomology; and	
		(D) determine time and cause of death through case studies.	

Resources: Books

Criminalistics	Richard Saferstein, Criminalistics: An Introduction to Forensic Science, 8th ed., Pearson-Prentice Hall, 2004	9780131118522
Cook	Nancy Cook, Classifying Fingerprints, Dale Seymour, 1995	978-0201493108
FSI	Richard Saferstein, Forensic Science: An Introduction, Pearson-Prentice Hall, 2008	9780131961418
Bertino	Anthony J. Bertino, Forensic Science: Fundamentals & Investigations, South-Western Cengage Learning, 2008	9780538445863
Fisher	Barry A.J. Fisher, Techniques of Crime Scene Investigation, 7th ed., CRC Press, 2004	978-0849316913
FSH1	Forensic Science Handbook, by Richard Saferstein, Prentice-Hall, 1982	130910589
FSH2	Forensic Science Handbook: Volume II, by Richard Saferstein, Prentice-Hall	133268772
Duke	Forensic Science Unit Training Manual, Duke University, 2002	
	State adopted General Chemistry textbooks	

Units of Study	Knowledge and Skills	Student Expectations	Resources
Resources: Web Sites			
TOX	Society of Forensic Toxicologists	http://www.soft-tox.org	
AFTE	Association of Firearm and Tool Mark Examiners	http://www.afte.org	
SWGGUN	Scientific Working Group for Firearms and Toolmarks	http://www.swggun.org	
IAI	International Association for Identification	http://www.theiai.org	
SWGFAST	Scientific Working Group on Friction Ridge Analysis, Study and Technology	http://www.swgfast.org	
DNA	DNA Advisory Board	http://www.cstl.nist.gov/strbase/dabqas.htm	
NFSTC	National Forensic Science Training Center	http://www.nfstc.org	
DNA	DNA Initiative	http://www.dna.gov	
AFDE	Association of Forensic Document Examiners	http://www.afde.org	
FBI	Guidelines for Forensic Document Examination	http://www.fbi.gov/hq/lab/fsc/backissu/april2000/swgdoc1.htm	
TRACE	Trace Evidence Recovery Guidelines	http://www.fbi.gov/hq/lab/fsc/backissu/oct1999/trace.htm	
HAIR	Forensic Hair Comparisons: Guidelines, Standards, Protocols, Quality Assurance and Enforcement	http://www7.nationalacademies.org/stl/April%20Forensic%20Bisbing.pd	
PAINT	Forensic Paint Analysis and Comparison Guidelines	http://www.fbi.gov/hq/lab/fsc/backissu/july1999/painta.htm	
FIBER	Forensic Fiber Examination Guidelines	http://www.fbi.gov/hq/lab/fsc/backissu/april1999/houcktoc.htm	
GLASS	Introduction to Forensic Glass Examination, Forensic Science Communications, January 2005, Volume 7, No. 1	http://www.fbi.gov/hq/lab/fsc/backissu/jan2005/index.htm	
DRUG	Scientific Working Group for the Analysis of Seized	http://www.swgdrug.org	
OSHA	OSHA Laboratory Safety & Health	http://www.osha.gov/SLTC/laboratories	