COWICHAN VALLEY
School District

Board/Authority Authorized Course: **Forensic Science 11**

School District/Independent School Authority Name: Cowichan Valley School District	**School District/Independent School Authority Number (e.g. SD43, Authority #432):** SD79 Cowichan Valley
Developed by: Mark Whitney	**Date Developed:** May 1st, 2019
School Name: Cowichan Secondary School	**Principal's Name:** Alison Keple
Superintendent Approval Date (for School Districts only):	**Superintendent Signature (for School Districts only):**
Board/Authority Approval Date:	**Board/Authority Chair Signature:**
Course Name: Forensic Science 11	**Grade Level of Course:** 11
Number of Course Credits: 4	**Number of Hours of Instruction:** 120 hours
Course Category: Protective Services	**Course Code:** YPSS-1A

Board/Authority Prerequisite(s): None – Science 10 Recommended.

Special Training, Facilities or Equipment Required:

General Laboratory Equipment (microscopes, tweezers, etc.)
Recommended forensic equipment i.e., (fingerprint powder, mock-blood testing equipment).
Teacher with a science background recommended.

Course Synopsis:

Forensic Science or Crime Scene Reconstruction is the use of scientific method, physical evidence, deductive reasoning and their interrelationships to gain knowledge of the events leading to the commission of a crime. Forensic Science 11 is a course that focuses on giving students a chance to gain and apply knowledge from the areas of history, math, biology, chemistry, physics, earth science, archeology, anthropology, law, medicine, and professional/technical writing. This course will expose students to current forensic science methods as well as discussing past practices and reasons for advancements in technology. This course will include a series of inquiry labs, discussion of case studies, field trips and guest speakers, internet research and practical labs that will allow students to strengthen skills of observation, interpretation, reasoning, and formal presentation. The students in this course will be required to design and carry out scientific investigations.

Goals and Rationale:

Forensic Science 11 will allow students to fully understand what becoming a forensic scientist entails and to discover areas of interest and potential career opportunities. Forensic Science is a field of study that involves the integration of many of the courses offered at our school, including but not limited to biology, chemistry, earth science/geology, physics, and some history (law and general history of forensic science).

By affording students an opportunity to take this course, it is hoped that they will become more motivated and interested in looking into the other fields of science. Through insight into the fields associated with Forensic Science, students should be assisted in determining their potential career goals including future choices of careers in Law enforcement or post secondary education in the sciences. Students will gain valuable and practical experience for future education, training and careers.

Indigenous Worldviews and Perspectives:

Learning involves patience and time: The structure of the course is centered on a collaborative learning environment. This will require students to make connections and organize their knowledge. Reflection on their own performance will be encouraged in order to further their own learning.

Learning requires exploration of one's identity: Through the learning process students are encouraged and asked to always return to their own unique experience. They will learn their strengths, challenges and their innate abilities and capacity to learn.

Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors: This principle will be supported by providing multiple access points for students to learn. The students will also be able to represent their learning in various ways.

BIG IDEAS

Forensic Science was developed in many different cultures and stretches back many centuries	Understanding the collection and analysis of biological evidence is a cornerstone of forensic investigation	Crime scene reconstruction is based on the collection and interpretation of physical evidence	Understanding the workings of the human mind is essential to all aspects of crime and criminality

Learning Standards

Curricular Competencies	Content
Students are expected to be able to do the following: • Understand the basic history of forensic science and the evolution of this area of study through time. • Define Forensic Science (or Crime Scene Reconstruction) as the use of scientific methods, physical evidence, deductive reasoning, and their interrelationship to gain knowledge of the sequence of events leading up to and surrounding the commission of a crime. • Identify how forensic science is used and its purpose in law enforcement. • Understand what is required of forensic scientists throughout the process of investigating a crime. • Identify the role of forensic scientists in the aftermath of a crime (including professional relationships with Law enforcement agencies). • Understand the essential elements of Canadian criminal law governing evidence found at crime scenes. • Demonstrate basic techniques used by forensic scientists to collect evidence from a crime scene and how that evidence is preserved.	*Students are expected to know the following:* • Examples in the evolution of forensic science • The scientific method and its application to solve forensic problems • Identify questions for scientific investigations • The work performed by forensic scientists and experts in a crime lab • The **Locard Exchange Principle** • The role of taxonomy in classifying and sorting evidence and crimes • How to compare and contrast indirect and direct evidence • How to describe and exemplify physical evidence • The difference between class and individual evidence • The criminal judicial system and the laws associated with it • Canadian criminal law • the levels of Police in Canada • the value of evidence in a court of law • the limitations of eyewitness accounts • how to apply physical and chemical methods to develop **latent prints**

• Understand the role of biological and pathological evidence, and its collection, during a crime investigation. • Recognize and understand use of different biological evidence and how to process that evidence (body fluids, blood stain patterns, drugs and poisons, hair, and DNA/genetics) • Recognize and understand use of different pathological evidence and how to process that evidence (manner/time/cause of death) – includes a small sections on entomology (study of insects) and the human skeleton (anthropology). • Understand how the different types of non-biological and trace evidence found at the scene of a crime can be useful tools to forensic scientists. • Microscopic Trace Evidence: collection of trace evidence; use of hair evidence; other forms of evidence (including fibers, glass, etc..) • Forensic Toxicology: drug use and driving; science behind testing for drugs; poisons; breathalyzer testing and physiological effects of alcohol on the body • Understand fingerprint analysis • Identify and use of other impression evidence • Identify what ballistic evidence is, why it can be very useful, and how it is produced. • Demonstrate knowledge of the basic types of firearms. • Understand the velocity, kinetic energy and trajectory of ballistic evidence. • Perform ballistic fingerprinting using real ballistic evidence to distinguish features unique to each firearm. • Understand the importance of testing for gunpowder residue on suspects and their clothing, as well as victims and what it can tell us about the position of a suspect during a shooting. • Understand what causes combustion (three required ingredients for any fire: oxygen, fuel, and heat). • Understand basic information about arson and explosives (and the crimes committed using either of these methods).	• the proper method for obtaining inked, readable fingerprints for each finger • the basic properties for fingerprint identification • how to recognize and classify ridge patterns (loops, whorls, and arches) • how to use points of identification to compare fingerprints • the difference between latent, plastic, and visible fingerprints • the structure of a hair using a compound microscope • how to compare and contrast human and animal hair specimens • how to design and carry out an experiment in **thin-layer chromatography** • the role of drug collection and analysis in a criminal investigation • the types of illicit drugs and explain their negative effects • the legal penalties for possession and use of controlled substances • the technology behind testing drugs (IR, UV-VIS spectroscopy and GC-MS analysis) and explain its use in forensic science • how reference materials (such as the Physician's Desk Reference) can be used to identify medications and their effects on the consumer • how to correlate blood alcohol, and breath test results with relation to levels of impairment • how a breathalyzer works • how pieces of evidence such as trace evidence, soil, and glass contribute to interpreting the crime scene • how to identify traces of white powder and metals • how to classify lip prints • how to compare paint chips from hit-and-run accidents. • how to classify soils and glass • how to use a **topographic map** to determine the location of a soil sample • the role of blood and DNA analysis in a crime scene investigation • the **agglutination process** of antibodies and antigens • how to identify bloodstains and variables in blood spatter patterns

• Recognize the steps involved in investigating an arson crime scene. • Identify the basic tools used in arson or explosive investigations. • Identify and understand the purpose of polygraph testing on suspects. • Understand what polygraph testers are looking for and how they detect these changes in human physiology. • Analyze written documents. • Understand what criminal profiling is and the various methods used to profile offenders.	• explain the **ABO/Rh classification system** • how to determine the blood type of a simulated bloodstain • what DNA is and how it uniquely identifies an individual being (such as humans, animals, plants, etc.) • how to isolate and extract DNA from a sample • the **process of electrophoresis** • how the analysis of impressions, documents, and cybercrime can contribute to solving a crime • that impressions can be used to classify tools, shoes, and tire tracks • the use of tire marks in the reconstruction of accidents • the correlation between shoe size to height using statistical reasoning • how to characterize personal handwriting using 12 points of analysis • how to detect deliberately disguised handwriting • what a watermark is and how it is made • how erasures on paper can be detected under UV light • how inks can be analyzed using **paper chromatography** • the types of criminal activity on the Internet • Create a criminal profile using garbage (laboratory).

Big Ideas – Elaborations

Forensic Science was developed in many different cultures and stretches back many centuries

Key Questions:

- What is the history of Forensic Science and how has this area of study evolved over time?
- How is the Scientific Method used in Forensic Science?

Understanding the collection and analysis of biological evidence is a cornerstone of forensic investigation

Key Question:

- What are the basics of Forensic Biology, Pathology, Forensic Entomology, Toxicology, Serology, Forensic Anthropology and Forensic Odontology

Crime scene reconstruction is based on the collection and interpretation of physical evidence

Key Question:

- How are Impression Evidence, Trace Evidence, Ballistics, and Arson Evidence used in Crime Scene Reconstruction and Forensic Science?

Understanding the workings of the human mind is essential to all aspects of crime and criminality

Key Question:

- What is Forensic Psychology and how is it used in criminal profiling, polygraph analysis, and understanding mental deviance?

Curricular Competencies – Elaborations

Key Questions:
Students will be able to:

- Use crime case studies throughout this course to increase their understanding of the various topics covered.
- Use some of histories high profile crimes to determine what we could have done today as forensic scientists to increase law enforcements ability to find the crimes offender.
- Apply decision-making strategies, logic and professional conduct to investigate the scene of a crime so as to preserve the law and the evidence left.

Content – Elaborations
Locard Exchange Principle: is the rule that the perpetrator of a crime will bring something into the crime scene and leave with something from it, and that both can be used as forensic evidence. **Latent Prints:** is an impression of the friction skin of the fingers or palms of the hands that has been transferred to another surface. **Thin Layer Chromatography:** is a technique used to separate non-volatile mixtures. **Topography Map:** is a type of map characterized by large-scale detail and quantitative representation of relief, usually using contour lines, but historically using a variety of methods. **Agglutination Process:** is the process that occurs if an antigen is mixed with its corresponding antibody called isoagglutinin. **ABO/Rh Classification System:** the classification of human blood based on the inherited properties of red blood cells as determined by the presence or absence of the antigens A and B, which are carried on the surface of the red cells. **Process of Electophoresis:** is the technique commonly used in the lab to separate charged molecules, like DNA, according to size. **Paper Chromatography:** is an analytical method used to separate coloured chemicals or substances. **Pre-crime scene preparations** and protection of evidence, tools used to collect and record location of evidence, and documentation of evidence collection. **Types and causes of patterns**; fingerprint ridge patterns; short and long-term latent fingerprints; finding and lifting latent fingerprints using lifting powders; fingerprint recognition; and enhancing fingerprints using Cryanoacrylate/Krazy Glue **Footprints analysis** (especially for unique impressions); handprints or other body impressions used to identify suspects

Recommended Instructional Components:

Course time will be divided among classroom instruction, practical workshops, laboratory participation, and research/case studies. Classroom instruction will focus on best practices:

- Student centered learning

- Purposeful and relevant content and tasks
- Co-operative learning opportunities
- Upper level and critical thinking skills, which include deductive reasoning, divergent and convergent thinking, cause and effect and concept attainment.
- Practical Workshops
- Guest speakers
- Case studies
- Laboratories

Assessment: Alignment with the Principles of Quality Assessment

This course is assessed by using the Triangulation of Assessment, which allows the teacher to collect evidence of student learning; this evidence is collected from the following three sources: conversations, observations, and products.

The following **Principles of Quality Assessment** will be noted:

- Assessment is ongoing, timely, specific, and embedded in day to day instruction
- Student is involved in assessment and feedback
- Assessment focuses on all three components of the curriculum model - knowing, doing, understanding
- Assessment provides ongoing descriptive feedback to students

The students will play an active role throughout all stages of assessment to ensure that they feel ownership of their work and to hear and provide feedback about how they are doing, and where to next?

Specific to this course:

Students assessment portion will be the following:

- Self-evaluation on tasks and assignments
- Peer evaluation of group projects

- Self-reflection (learning logs of case studies)

Teacher assessment portion will be the following:

- Laboratory investigations and techniques used
- Lesson quizzes and unit tests
- Classroom and research assignments
- Presentations

Learning Resources:

May include but not limited to:

Kowalyk, Audri; Kowalyk, Apollo; and Christensen, Susanne: **Introductory Forensic Science Teacher Resource Manual**, 2002.

Kowalyk, Audri; Kowalyk, Apollo; and Christensen, Susanne: **Advanced Forensic Science Teacher Resource Manual**, 2003.

Kowalyk, Audri; Kowalyk, Apollo; and Christensen, Susanne: **Introductory to Crime Case Studies**, 2006.