



Rhinebeck Forensic Science Elective Course Curriculum 2009

Created by teachers from the Rhinebeck School District

Rhinebeck Prioritized Curriculum Forensic Science

INTRODUCTION

This is a living document. We encourage teachers to refine the document as further information and resources become available. Teachers are encouraged to use this document as a springboard for further detailing the key components to meet the needs of their own grade level population. Teachers are strongly expected to immediately begin to use this document as a guide for lesson and unit planning. **FEEDBACK IS ESSENTIAL.** Suggestions for further improvement on the format and content are welcome.

TABLE OF CONTENTS

New York State Science Standards	3
Key Components	4
Texts	4
Guest Speaker List	4
Introduction to Forensic Science.....	6
The Crime Scene.....	7
Fingerprints	8
Physical Evidence.....	9
Chemical Analysis	10
The Microscope.....	11
Hairs, Fibers, and Paint.....	12
Drugs and Toxicology.....	13
Forensic Serology.....	14
DNA As A Forensic Tool.....	15
Firearms and Tool Marks	16
Document and Voice Examination	17
Special Topics	18

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NEW YORK STATE SCIENCE STANDARDS

- Standard 1 Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.
- Standard 2 Students will access, generate, process, and transfer information using appropriate technologies.
- Standard 3 Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically, by applying mathematics in real-world settings, and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry.
- Standard 4 Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.
- Standard 5 Students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.
- Standard 6 Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.
- Standard 7 Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.

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Forensic Science

Key Components

The following key components appear at each grade level:

- **ESSENTIAL KNOWLEDGE and SKILLS** - Each list of essential knowledge and skills express what students are expected to know and be able to do at that grade level or in that course.
- **VOCABULARY/CONCEPTS** - These concepts/themes correlate to the Career Development and Occupational Studies Curriculum
- **GUIDING QUESTIONS** - These questions, written by teachers, help define the focus of each topic. This is not an inclusive list, but rather a starting point.
- **CLASSROOM IDEAS** - These ideas, generated by classroom teachers, are not required activities, but rather some ideas to try. Teachers are encouraged to add their own ideas.
- **ASSESSMENT IDEAS** - These ideas, generated by classroom teachers, often correspond to the classroom ideas. They are not required, but rather are some examples of alternative assessments to try. They may, in some instances, replace paper and pencil tests. In other instances, they may supplement the traditional forms of assessment. Again, teachers are encouraged to add their own ideas.

Texts

The Casebook of Forensic Detection-

How Science Solved 100 of the World's Most Baffling Crimes by Colin Evans copyright-1996

Guest Speaker List

Troop K-

- Investigator MacLarty- CSI Dutchess County
- Trooper Wilson- Drugs and the Law
- Trooper Galm- Canines in the Police Force

Albany Crime Lab-

- Ms. Day- DNA Analyst
- Sergeant Grazier- Ballistics

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Forensic Science

Dutchess County Medical Examiner's Office

- Chief Medical Investigator Brady- Sent to unattended deaths
- Dr. Reiber- Dutchess County Medical Examiner- Autopsies

Dutchess County District Attorney

- Ms. Gina Barry- Forensic Artist

Crime Victim's Assistance Program

- Ms. Erin Ptak and Kim Dangerfield- Crimes of a sexual nature

Dr. Myerson- Forensic Odontology

Dutchess County Police Department

- Detective Chris Aderholt- Instructor at the Police Academy on how to photograph a crime scene

Dutchess County Sheriff's Office-

- Sergeant Matt Heneka- roles of the SWAT team
- Detective Daren Cummings- Forensic interrogation techniques

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<i>Introduction to Forensic Science</i>				
Standards: 3, 7				
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>	<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
Introduction to Forensic Science <ul style="list-style-type: none"> • Definition of Forensic Science or Criminalistics • History and Development of Forensic Science • Services of the Crime Laboratory • Functions of Various Personnel Involved in Criminology • Case Studies- famous cases in which Forensic Science played a role 	Cause of Death	Algor mortis Autopsy Expert witness Livor mortis Locard's Exchange Principle Rigor mortis Medical examiner Forensic pathologist Forensic scientist Forensic anthropologist Forensic entomologist Forensic psychologist Forensic odontologist Forensic science	<ul style="list-style-type: none"> • Jigsaw pgs 22-40 • Read and write a summary report <u>Labs</u> <ul style="list-style-type: none"> • I'm Clueless • I've Got My Eye On You 	Test on 'Introduction to Forensic Science'

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<i>The Crime Scene</i>				
Standards: 1, 6, 7				
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>	<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
The Crime Scene <ul style="list-style-type: none"> • Processing the Crime Scene • Legal Considerations at the Crime Scene • Case Reading 	Trace Evidence	Buccal swab Chain of custody Finished sketch Physical evidence Rough sketch Standard/reference sample Substrate control Physical evidence Warrantless search	<ul style="list-style-type: none"> • Jigsaw pgs 249-269 • Read and write summary report <u>Labs</u> <ul style="list-style-type: none"> • Don't Touch The Evidence 	Test on the crime scene

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<i>Fingerprints</i>				
Standards: 1, 2, 4				
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>	<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
Fingerprints <ul style="list-style-type: none"> • History of Fingerprints • Physiology of Fingerprints • Principles of Fingerprint Identification • Fingerprinting Classification • Detection and Development of Latent Prints • Case Readings 	Finger-printing	Anthropometry Arch Fluoresce Iodine fuming Latent fingerprint Loop Plastic print Ridge characteristics (minutiae) Sublimation Super Glue fuming Visible print Whorl Plain arch Tented arch Ulnar loop Radial loop Plain whorl Double loop whorl Accidental whorl Central pocket loop whorl Henry number Delta Core Dermal papillae Epidermis Dermis	<ul style="list-style-type: none"> • Jigsaw pgs 90-121 • Read and summary report <u>Labs</u> <ul style="list-style-type: none"> • Personal Identification • Loops, Whorls and Arches • Finger-printing 	Test on finger-printing

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Physical Evidence					
Standards: 1, 4, 7					
Essential Knowledge/Skills	Chapter	Vocabulary/Concepts		Classroom Ideas/Labs	Assessment Ideas
Physical Evidence <ul style="list-style-type: none"> • Common Types of Physical Evidence • Crime Scene Reconstruction • Physical Properties of Matter • Physical Changes of Matter • Forensic Characteristics of Glass • Forensic Characteristics of Soil • Footprints and Tire Tracks • Case Readings 	Time of Death	Amorphous solid Atom Becke line Birefringence Celsius scale Chemical property Concentric fracture Crystalline solid Density Dispersion Fahrenheit scale Intensive property Laminated glass Mass Density-gradient tube Class characteristics Individual characteristics Crime scene reconstruction	Mineral Physical property Radial fracture Refraction Refractive index Tempered glass Weight Comparison Identification Product rule Temperature Heat Glass	<ul style="list-style-type: none"> • Jigsaw pp. 90-121 • Read and write a summary report <p><u>Labs</u></p> <ul style="list-style-type: none"> • Glass is Breaking Up • Glass can Tell on You • If the Shoe Fits • Tread Lightly 	Test on Physical Evidence

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<i>Chemical Analysis</i>					
Standards: 1, 2, 6, 7					
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>		<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
<ul style="list-style-type: none"> • Chemical Analysis • Organic Analysis 		Chromatography Matter Element Fluoresce Gas (vapor) Inorganic Laser Monochromator Periodic table Photon Proteins Solid Spectrophotometry Visible light x-ray Electromagnetic spectrum Monochromatic light	Compound Electrophoresis Enzyme Frequency Infrared Ion Liquid Organic Phase Physical state Pyrolysis Sublimation Ultraviolet Wavelength	<u>Labs</u> <ul style="list-style-type: none"> • Bleeding Mixtures 	Test on Organic Analysis

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<i>The Microscope</i>				
Standards: 1, 4, 6, 7				
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>	<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
The Microscope <ul style="list-style-type: none"> • Compound Light Microscope • The Comparison Microscope • The Stereoscopic Microscope • The Scanning Electron Microscope • Case Reading 	Identification of Remains	Binocular Condenser Depth of focus Eyepiece lens Field of view Monocular Objective lens Real image Virtual image Stereoscope Microspectro-photometer Transmitted illumination Vertical or reflected illumination Transmission electron microscope Scanning electron microscope Compound light microscope Comparison microscope Total magnification Micrometer	<ul style="list-style-type: none"> • Jigsaw pp. 166-196 • Read and write a summary report <u>Labs</u> <ul style="list-style-type: none"> • Practice in the Use of the Microscope • The Cornfield Murders 	<ul style="list-style-type: none"> • Test on The Microscope • Project- Criminal Investigation

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<i>Hairs, Fibers, and Paint</i>				
Standards: 1, 4, 7				
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>	<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
Hairs, Fibers, and Paint <ul style="list-style-type: none"> • Hairs • Fibers • Paints • Case Readings 	Trace Evidence	Anagen phase Catagen phase Cortex Cuticle Follicular tag Macromolecule Man-made fibers Medulla Mitochondrial DNA Molecule Monomer Natural fibers Nuclear DNA Polymer Telogen phase Electrocoat primer Primer surfacer Basecoat Clearcoat Paint Pyrolysis gas chromatography	<ul style="list-style-type: none"> • Jigsaw pp. 271-290 • Read and write a summary report <p><u>Labs</u></p> <ul style="list-style-type: none"> • Only Your Hair Dresser Knows for Sure • Fibers Don't Fib • The Story of a Flake of Paint 	Test on Hairs, Fibers and Paint

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<i>Drugs and Toxicology</i>					
Standards: 4, 6, 7					
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>		<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
Drugs and Toxicology <ul style="list-style-type: none"> • Drugs • Forensic Toxicology • Case Readings 	Toxicology	Anabolic steroids Confirmation Hallucinogen Screening test Stimulant Acid Anticoagulant Base Catalyst Fuel cell Oxidation Preservative Microcrystalline tests Physical dependence Psychological dependence Field sobriety test	Analgesic Depressant Narcotic pH scale Absorption Alveoli Artery Capillary Excretion Metabolize Vein Henry's Law	<ul style="list-style-type: none"> • Jigsaw pgs 230-248 • Read and write a summary report <u>Labs</u> <ul style="list-style-type: none"> • White Powders • Drug Bust Kit 	<ul style="list-style-type: none"> • Test on Toxicology • Project: Toxicology

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Forensic Serology					
Standards: 1, 4, 6, 7					
Essential Knowledge/Skills	Chapter	Vocabulary/Concepts		Classroom Ideas/Labs	Assessment Ideas
Forensic Serology <ul style="list-style-type: none"> • The Nature of Blood • Forensic Characterization of Bloodstains • Stain Patterns of Blood • Collection and Preservation of Blood Evidence • Principles of Heredity • Forensic Characterization of Semen • Collection of Rape Evidence • Case Readings 	Forensic Serology	Acid phosphatase Allele Antigen Aspermia DNA Enzyme Gene Hemoglobin Homozygous Oligospermia Plasma Precipitin Serum X chromosome Y chromosome Monoclonal antibodies	Agglutination Antibody Antiserum Chromosome Egg Erythrocyte Genotype Heterozygous Locus Phenotype Polymorphism Serology Sperm Zygote	<ul style="list-style-type: none"> • Jigsaw pgs 197-216 • Read and write a summary report <p><u>Labs</u></p> <ul style="list-style-type: none"> • A Bloody Mess • What Type Are You? • Blood Strains on the Ground • Blood Spatter • Forensic Mystery Kit 	Test on Serology

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<i>DNA As A Forensic Tool</i>					
Standards: 1, 2, 4, 6, 7					
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>		<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
DNA as a Forensic Tool <ul style="list-style-type: none"> • What is DNA? • PCR (polymerase chain reaction) • DNA Typing • Mitochondrial DNA • The Combined DNA Index System (CODIS) • The Collection and Preservation of Biological Evidence for DNA Analysis • Case Readings 	DNA Typing	Amino acids chromosome Epithelial cells Hybridization Mitochondria Polymer Proteins sequencing Tandem repeat Mitochondrial DNA Complementary base pairing Polymerase chain reaction Restriction enzymes Restriction fragment length polymorphisms (RFLPs) Short tandem repeat (STR)	Buccal cells DNA Human genome Low copy number Nucleotide Primer Replication Substrate control Y-STRs	<ul style="list-style-type: none"> • Jigsaw pgs 55-69 • Read and write a summary report <u>Labs</u> <ul style="list-style-type: none"> • DNA Fingerprinting • Match the Lines • DNA Print Analysis 	Test on DNA as a Forensic Tool

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<i>Firearms and Tool Marks</i>					
Standards: 4, 6, 7					
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>		<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
Firearms and Tool Marks <ul style="list-style-type: none"> • Firearms • Tool Marks • Case Readings 	Ballistics	Bore Caliber Extractor Gauge Grooves Rifling GSR Propellant Recoil Velocity Kinetic energy Distance determination Firearms identification	Breechblock Choke Ejector Greiss test Lands Striations Trajectory Primer Ricochet	<ul style="list-style-type: none"> • Jigsaw pgs 3-21 • Read and write a summary report <u>Labs</u> <ul style="list-style-type: none"> • Firearms: A Comparison of Velocity, Kinetic Energy and Trajectory 	Test on Firearms and Tool Marks

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<i>Document and Voice Examination</i>				
Standards: 6, 7				
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>	<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
Document and Voice Examination <ul style="list-style-type: none"> • History of Document Examination • Principles of Handwriting Identification • Principles of Typewriter Identification • Alterations • Collection and Preservation of Document Evidence • Case Readings • Voice Examination (Case Studies) 	Disputed Documents and Voice-prints	Charred document Erasure Exemplar Indented writings Infrared luminescence Natural variations Obliteration Questioned document Voiceprint	<ul style="list-style-type: none"> • Jigsaw pp. 41-54 and 291-300 • Read and write a summary report <u>Labs</u> <ul style="list-style-type: none"> • Write On! • Tattle-Tale Type 	Test on Documentation and Voice Examination

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<i>Special Topics</i>					
Standards: 4, 6, 7					
<i>Essential Knowledge/Skills</i>	<i>Chapter</i>	<i>Vocabulary/Concepts</i>		<i>Classroom Ideas/Labs</i>	<i>Assessment Ideas</i>
Special Topics Application of: <ul style="list-style-type: none"> • Computers in Forensic Science • Odontology • Forensic Pathology • Physical Anthropology • Forensic Entomology • Case Readings 	Odontology, Forensic Anthropology, and Psychological Profiling	<u>Anthropology</u> Axial skeleton Long bones Short bones Irregular bones Flat bones Compact bone Spongy bone Red marrow Pelvic girdle Ante mortem Ante mortem Peri mortem Perinatal Shearing force Torsion force Compression force Greater sciatic notch Sopraorbital ridge Blunt force trauma Sharp force trauma Projectile trauma Forensic anthropology Appendicular skeleton	Hyoid bone Yellow marrow Pectoral girdle osteology Post mortem Cranial sutures Neonatal Bending force Tension force Subpubic angle <u>Odontology</u> Canines Incisors Molars Misalignment Forensic odontology	<ul style="list-style-type: none"> • Jigsaw pgs 122-165 • Read and write a summary report <u>Labs</u> <ul style="list-style-type: none"> • Take a Bite out of Crime • Teeth and Bite Marks • Flying Clocks • Animal Bone Investigation • Building Up a Human Skeleton • Skeletal Comparison of Males and females • Forensic Bones 	Test on Special Topics in Forensic Science