

# **Forensics: The Science of Crime Course Syllabus**

## **What you will learn in this course**

### **Forensics: The Science of Crime**

Fingerprints. Blood spatter. DNA analysis. The world of law enforcement is increasingly making use of the techniques and knowledge from the sciences to better understand the crimes that are committed and to catch those individuals responsible for the crimes. Forensic science applies scientific knowledge to the criminal justice system. This course focuses on some of the techniques and practices used by forensic scientists during a crime scene investigation (CSI). Starting with how clues and data are recorded and preserved, the student will follow evidence trails until the CSI goes to trial, examining how various elements of the crime scene are analyzed and processed.

### **Unit 1: Introduction to Forensic Science**

Blood, fingerprints, tire tracks, and trace evidence are used to catch the criminals in TV, but how do real life forensic scientists help identify suspects? In this unit, you will be introduced to forensic science. We will discuss what forensic science consists of and how the field developed through history. You will learn about some of the responsibilities of forensic scientists and about some of the specialty areas that forensic scientists may work in.

#### **What will you learn in this unit?**

- Learn about forensic science as a field of study.
- Discuss the history and development of the field of forensic science.
- Examine some of the responsibilities that forensic scientists have in their work.
- Investigate the relationship between forensic science and the criminal justice system.
- Explore some of the specialty areas within forensic science.

### **Unit 2: The Crime Scene**

Once a crime has been committed, one of the first steps for the forensic scientist is the identification and collection of evidence. In this unit, you will discover some of the techniques and practices that forensic scientists and law enforcement officials use to identify evidence and collect that evidence in a way that maintains the integrity of the evidence. You will also learn about some of the different types of evidence that might be found at a crime scene and how the different types of evidence may best be handled.

#### **What will you learn in this unit?**

- Discover how a crime scene is secured.
- Examine the different ways in which a crime scene is recorded.
- Learn how forensic scientists and officers search a crime scene for evidence.

- Investigate how evidence is collected and packaged.
- Learn why evidence needs to be collected carefully and within legal guidelines.

### **Unit 3: Physical Evidence**

In this unit, we will discuss the physical evidence found at crime scenes. In doing so, we will examine the different types of evidence that are used in a crime investigation and in court trials. We will also discuss how forensic scientists and investigators identify and collect evidence. Finally, we will look at some specific examples of physical evidence, including glass, soil, and impressions, to see how forensic scientists identify and analyze these types of evidence.

#### **What will you learn in this unit?**

- Learn about the different types of evidence.
- Examine the difference between individual and class characteristics and what they mean for crime investigations.
- Discuss how physical and chemical properties help forensic scientists compare samples.
- Investigate glass fragments and soil as physical evidence and what they can tell forensic scientists about a crime.
- Discuss how impressions, like footprints and tire tracks, are collected and analyzed.

### **Unit 4: Physical Evidence: Hair, Blood, and Fingerprints**

In this unit, we will examine three potentially important types of physical evidence: hair, blood, and fingerprints. For each of these types of evidence, we will look at how the evidence may be collected and how the evidence might be tested. We will also discuss some of the challenges in examining these types of evidence and what we might learn from them.

#### **What will you learn in this unit?**

- Learn about the physical structures of hair, blood, and fingerprints.
- Discuss how DNA can be found in hair collected from crime scenes.
- Investigate how stains are tested to determine if they are blood and if they are human blood.
- Learn about the different types of fingerprints.
- Examine how fingerprints are discovered and collected at a crime scene.

### **Unit 5: Firearms and Tool Marks**

In this unit, we will discuss the collection and analysis of firearm and tool evidence. We will learn some of the considerations in collecting this type of evidence. We will also examine what information forensic scientists can learn from evidence like firearms, bullets, gunpowder residue, and tool marks that are left at a crime scene. Finally, we will discuss under what conditions individual characteristics might be found on these types of evidence.

#### **What will you learn in this unit?**

- Discuss how firearm and bullet evidence is collected from a crime scene.
- Learn why bullets fired from a gun can contain unique markings and striations.
- Examine how investigators can estimate the distance between a gun and a shooting victim.
- Investigate what information forensic scientists can learn from tool marks.
- Discuss how forensic scientists can recover serial numbers from firearms and vehicles.

## **Unit 6: Human Remains**

In this unit, you will learn more about how forensic scientists examine human remains and gain information from these remains. We will discuss some of the ways that forensic scientists try to determine the time of death for recovered human remains. We will also discuss how forensic scientists make use of the forensic autopsy to gain more information about a probable cause of death and mechanism of death. Finally, we will discuss what scientists can learn about the condition of bones found at a crime scene and some of the ongoing research by forensic scientists to learn more about rates of decomposition.

### **What will you learn in this unit?**

- Investigate some of the ways that can help determine the time of death.
- Learn about some different ways that bodies may decompose.
- Discuss what forensic scientists can learn from a forensic autopsy.
- Examine what information can be gained from skeletal remains.
- Learn about ongoing research into decomposition rates.

## **Forensics: The Science of Crime Midterm Exam**

- Review information acquired and mastered from this course up to this point.
- Take a course exam based on material from the first six units in this course (Note: You will be able to open this exam only one time.)

## **Unit 7: DNA Evidence**

In this unit, we will discuss what DNA is and how it is used as evidence in crime investigations. We will examine the basic components of DNA and learn what makes the DNA of each person unique. The unit will also discuss how biological evidence, like blood or hair samples, is preserved for DNA testing. Finally, we will examine the use of DNA evidence in court cases and some of the considerations that occur in these cases.

### **What will you learn in this unit?**

- Learn about the properties of DNA.
- Examine how and why DNA can be used as an individual characteristic in forensic science.
- Investigate how biological evidence is best collected and preserved for DNA testing.
- Discuss what tests are used on biological evidence to retrieve DNA information.

- Examine some of the considerations in using DNA in court trials.

## **Unit 8: Arson and Explosion Evidence**

In this unit, we will discuss how forensic science approaches crime scenes in which fire or explosions have occurred. In doing so, we will learn about the challenges that these crime scenes present in the collection of evidence, the methods used to determine the point of ignition, and how evidence is collected and preserved at arson scenes. We will also examine some of the different types of explosives and how explosive materials are collected and preserved.

### **What will you learn in this unit?**

- Discuss what challenges arson and explosion crime scenes present in the collection, preservation, and analysis of evidence.
- Learn how investigators determine where a fire started and whether accelerants were used.
- Examine the different types of explosive materials that may be used in bombs and other explosions.
- Investigate how evidence at an arson scene is collected and tested.
- Discuss the methods used to test for explosive materials at crime scenes.

## **Unit 9: It's Elementary Science, Dear Watson**

Science: it's a discipline that has helped mankind send humans to the moon, to explore the deepest recesses of ocean floor, and to be able to peer deep within our bodies' cells to learn how to fight diseases better. Most of us trust science to tell us what is true about the world. But just what is so scientific about forensic science? In this unit, you'll discover how forensic science, just like other scientific disciplines, uses the scientific method to arrive at conclusions we can rely on. We'll even apply scientific research tactics to analyze a crime scene of our own!

### **What will you learn in this unit?**

- Follow the steps of the scientific method
- Apply the scientific method to a forensic science case
- Discuss different epistemologies and how we know what information to trust
- Distinguish between facts and theories
- Understand how scientific knowledge changes over time

## **Unit 10: Under the Microscope**

Blood, bodies, DNA: there's no escaping biology at the crime scene. Forensic biologists use their knowledge of biological systems to analyze evidence. Anything from a single cell to an entire human population might yield important clues. In this unit, we'll learn the principles behind cell biology, molecular biology, and genetics. We'll explore how forensic scientists apply these principles in their work. We'll also discover how new technologies in DNA typing and genetic analysis are revolutionizing criminal investigations.

### **What will you learn in this unit?**

- Explain the biological levels of organization
- Describe the structure and function of cells
- Understand the role of macromolecules in the human body
- Discuss how traits are genetically inherited
- Apply biological concepts to forensic investigations

## **Unit 11: The Forensic Formula**

A man's body is found at the base of a tall building. Did he fall, jump, or was he pushed? Two cars collide and spin off the road. Who was at fault, and how did the accident happen? A woman ingested a lethal toxin. Was it an overdose, or was she poisoned? What substance caused her death? These are just a few examples of the many applications of physics and chemistry in forensic science. The physical sciences are all around us—in our movements, interactions, and environment. Forensic scientists apply the principles of physics and chemistry to better understand and reconstruct crimes.

### **What will you learn in this unit?**

- Understand the use of applied physics and chemistry in forensic science
- Explain Newton's laws of motion and the conservation of momentum
- Describe how the electromagnetic spectrum is used in forensic science
- Identify the types of energy and states of matter
- Relate the study of chemical reactions to criminal investigations

## **Unit 12: Lying Eyes**

Let's go on a journey inside the criminal mind. We know that almost all crimes leave behind at least small traces of physical evidence, but what psychological clues about the offender can we find when we observe the crime scene? Forensic psychologists study why criminals commit crimes and are able to decode the smallest, seemingly most insignificant of details at a crime scene to tell law enforcement what type of criminal committed the crime! Partially buried body in a murder investigation? That may indicate a suspect who knew the victim personally. Did the criminal leave a note? The words they used can tell us a lot about who this person is. In this unit, you'll travel inside the minds of criminals and the investigators who chase them. We'll learn about how forensic psychologists develop a profile of an offender as they investigate a crime scene, the ways bias may creep into the profiling process, and how technology and good old-fashioned people skills can help law enforcement detect truth from lies.

### **What will you learn in this unit?**

- Trace the case of the Unabomber from his criminal activity to ultimate capture
- Describe how criminal profiling can help forensic scientists identify suspects
- Understand the effect that cultural bias can have on the criminal profiling process
- Explain how polygraph machines detect possible evidence of deception

- Analyze how interrogation techniques might elicit false confessions

### **Forensics: The Science of Crime Final Exam**

- Review information acquired and mastered from this course up to this point.
- Take a course exam based on material from units seven to twelve in this course – the last six units. (Note: You will be able to open this exam only one time.)

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