

# Minnesota State University Moorhead

## CHEM 105: Crime Scene Science

### A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: 2

Lab Hours/Week: 2

OJT Hours/Week: \*.\*

Prerequisites: None

Corequisites: None

MnTC Goals: Goal 03 - Natural Science, Goal 09 - Ethical/Civic Resp

Students will study basic chemical and science principles in the context of crime scene investigations. Analysis of forensic data will accompany the content, which will provide an understanding of the scientific method, the relationship between hypotheses and theories, data collection and analysis. Students will also examine the ethical considerations of forensic evidence and how it is presented and interpreted in a court of law. Credit not applicable to a chemistry major or minor. MnTC Goal 3 and 9.

### B. COURSE EFFECTIVE DATES: 09/22/2011 - Present

### C. OUTLINE OF MAJOR CONTENT AREAS

1. The scientific method and application of scientific method to each of the class lab exercises.
2. Biochemicals in living systems and their detection and identification of individuals based on their individual characteristic such as fingerprints and DNA patterns.
3. Labs include analysis of simulated latent fingerprints, chemicals, DNA, human remains, etc. to determine identity or time of death. Each also includes a discussion of confidence/uncertainty in the data and conclusion.
4. Atoms, molecules and the periodic table and study of spectroscopy in forensic science.
5. Light and other types of radiation that interact with living and non-living materials and how this can be used to analyze gathered evidence.
6. Changes in how and what forensic evidence has been permitted in/handled in courts, from Daubert through the 2009 NAS report and beyond.
7. Ethics of forensic technologies, such as database searches - where do the potential matches in the database come from? Function creep? Diversity, equity and inclusion concerns.
8. The science of combustion and other energy considerations, in the context of crimes such as arson investigation.
9. Formulas, equations, compounds and reactions using forensic science testing as examples.
10. Classes of forensically significant compounds (explosives, accelerants, drugs) and their properties and detection in crime scene investigations.

## **D. LEARNING OUTCOMES (General)**

1. Understand the influence of society on the practice of science.
2. Examine, articulate, and apply their own ethical views about societal issues based on a scientific understanding of the underlying phenomena.
3. Understand and apply core concepts (e.g. politics, rights and obligations, justice, liberty) to specific forensic issues such as uncertainty and error, racial bias in facial recognition software, etc.
4. Analyze and reflect on the ethical dimensions of legal, social, and scientific issues.
5. Explain the basic concepts of sciences such as chemistry and related disciplines as they relate to forensic investigations.
6. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
7. Communicate their experimental findings, analyses, and interpretations both orally and in writing.
8. Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

## **E. Minnesota Transfer Curriculum Goal Area(s) and Competencies**

### **Goal 03 - Natural Science**

1. Demonstrate understanding of scientific theories.
2. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.
4. Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

### **Goal 09 - Ethical/Civic Resp**

1. Examine, articulate, and apply their own ethical views.
2. Understand and apply core concepts (e.g. politics, rights and obligations, justice, liberty) to specific issues.
3. Analyze and reflect on the ethical dimensions of legal, social, and scientific issues.

## **F. LEARNER OUTCOMES ASSESSMENT**

As noted on course syllabus

## **G. SPECIAL INFORMATION**

None noted