

MIDDLESEX COUNTY COLLEGE
EDISON, NEW JERSEY
DEPARTMENT OF NATURAL SCIENCES

Course ID and Name: SCI 206: Introduction to Forensic Science

Department: Department of Natural Sciences

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Prerequisites: MAT-013, MAT-013B or appropriate score on the College placement test.

Co-requisites: N/A

Course Description:

This course is an introductory course in which scientific principles will be applied to the methods used to investigate and solve crimes. The course will focus on the principles and methods utilized in the traditional sciences of biology, chemistry, and physics. The scientific techniques used to collect and analyze evidence will be covered.

General Education Status: Science

Credits: 3 Lecture Hours: 2 Lab Hours: 2

Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe how a particular science becomes accepted in court as a forensic science.
2. Define and explain the Scientific Method as it applies to the Forensic Sciences.
3. Describe the procedures employed when legally, safely and properly preserving and documenting a crime scene.
4. Define physical evidence in its various forms and exhibit a working knowledge of the recognition, preservation, documentation and collection of physical evidence.
5. Accurately describe observations made when examining and comparing various types of physical evidence during laboratory exercises in order to generate objective and scientifically accurate bench notes.

Course Requirements:

Students must attend every lecture and laboratory session. Lecture performance is evaluated by exams, participation and quizzes. Laboratory performance is measured through practical exercises,

examinations, laboratory reports, and observation of student laboratory technique. Laboratory assignments augment lecture material.

Assessment tool	% of final grade
Midterm Exam	25%
Final Exam	25%
Lab Exercises & Reports	10%
Quizzes (4) Lowest grade dropped	30%
Class and Lab Participation	10%

GRADING STANDARD:

Upon completion of the course, grades will be assigned as follows:

- A = 90 - 100%**
- B+ = 87 - 89%**
- B = 80 - 86%**
- C+ = 77 - 79%**
- C = 70 - 76%**
- D = 60 - 69%**
- F = <60%**

Course Content Areas:

Historical Perspective: Together with a general overview of the history of the Forensic Sciences the historical perspective of individual scientific areas which have come into common usage within the Criminal Justice System will be explored.

Crime Scene Analysis: The physical evidence, which will ultimately be analyzed by the forensic scientist, is found at the crime scene. Therefore, the proper security, preservation and documentation of the crime scene as well as evidence collection protocols will be discussed in detail.

The Crime Laboratory: The legal questions posed by any given case can ultimately be answered through the analysis of the evidence in the crime laboratory. This course examines the various laboratory instruments and techniques which are utilized in an attempt to reconstruct the events and identify the perpetrators of crimes.

Legal Perspective: While addressing legal questions through the application of the natural sciences Forensic Science practitioners must be aware of and strictly abide by legal precedents concerning concepts such as search and seizure and admissibility. Case law established in these areas will be examined and discussed throughout this course.

Textbook for Course:

Author

Title

Publisher

Copyright

From the Crime Scene to
the Crime Lab 4th Edition

Lecture Outline

- FORENSIC SCIENCE OVERVIEW
 - Definition of Forensic Science.
 - Early pioneers in Europe and abroad.
 - Forensic Science in the U.S.
 - Crime Lab functions and hierarchy.
 - The Scientific Method.
 - Case law – admissibility of science in court.
 - Physical evidence characteristics.

- THE CRIME SCENE
 - Crime scene safety and PPE.
 - Crime scene security and preservation.
 - Crime scene dimensions.
 - Controlling personnel.
 - Search techniques.
 - Collection methods and containers.
 - General documentation methodologies - sketching.

- CRIME SCENE & EVIDENCE PHOTOGRAPHY
 - Basic photographic principles – illumination x time.
 - Aperture and shutter speed.
 - Depth of field.
 - Lenses.
 - Digital sensors.
 - Use of external flash.
 - Legal requirements.
 - Long shots, medium shots and close-up photography.

- LABORATORY ANALYSIS / GENERAL
 - Visual analysis of physical evidence.
 - Questioned versus known exemplars.
 - Forensic data bases.
 - Qualitative and quantitative analysis.
 - Laboratory measurements.
 - Physical and chemical properties.

- TRACE EVIDENCE – HAIR AND FIBERS
 - Hair evidence – documentation and collection.
 - Known control samples.
 - Morphology of hair.
 - Class and individual characteristics.

- Laboratory analysis.
 - Fiber evidence – documentation and collection.
 - Known control samples.
 - Natural and synthetic fibers.
 - Laboratory analysis.
- TRACE EVIDENCE - PAINT
 - Paint evidence - documentation and collection.
 - Automotive paint coatings.
 - Known exemplar collection.
 - Class and individual characteristics.
 - Lab analysis - Pyrolysis Gas Chromatography.
 - Paint databases.
- TRACE EVIDENCE - GLASS
 - Types of glass / glass production techniques.
 - Radial and concentric fractures.
 - Determination of direction of force - 3R rule.
 - Bullet fractures in glass.
 - Lab analysis - Refractive Index / Density.
- TRACE EVIDENCE - SOIL
 - Define soil and its constituents.
 - Soil colors, texture and possible man-made contaminants.
 - Soil evidence collection.
 - Class versus individual characteristics.
 - Significance of "clumping" in wheel wells.
 - Lab analysis - Forensic Geologist role.
- FIREARMS IDENTIFICATION
 - Historical perspective - Colonel Goddard.
 - Ballistics (trajectory) versus Firearms Identification (tool marks).
 - Handguns - revolvers versus pistols.
 - Rifled barrel production / barrel characteristics.
 - Rifled barrel caliber.
 - Spent bullets and shell casings.
 - Class versus individual characteristics.
 - Lab analysis - the comparison microscope.
 - Shotguns - smooth bore weapons measured in "gauges."
 - Gunshot residue testing / distance determination.
 - Shooting scene reconstruction.
- TOOLMARKS
 - Tool mark documentation and collection.
 - Known exemplar production.

- Compression versus striation marks.
- Lab analysis - the comparison microscope.

- IMPRESSION EVIDENCE - FOOTWEAR AND TIRETRACKS
 - Footwear evidence types - plastic, patent and latent.
 - Documentation and collection.
 - Tire brand, size, and model and tread patterns.
 - Impression photography and casting.
 - Class versus individual characteristics.
 - Lab analysis - use of photos and casts.

- BITEMARK EVIDENCE
 - Documentation and collection.
 - Use of oblique lighting and ABFO scales.
 - Silicone putty casting.
 - Class versus individual characteristics.
 - Consequences of skin rebounding.
 - Lab analysis and comparisons by Odontologist

- QUESTIONED DOCUMENT EXAMINATION
 - Ambiguous acceptance in various court systems.
 - Handwriting style initially learned.
 - Zaner-Blosser and Palmer methods.
 - Characteristic features - scale, printing versus cursive, slope, spacing, etc.
 - Known exemplars - Request and Non-request standards.
 - Lab analysis - totality of characteristics; no set standard.
 - Ink and paper analysis.
 - Obliterations and alterations.
 - Lab analysis - Video Spectral Comparator.

- INTRODUCTION TO FINGERPRINT SCIENCE
 - Criminal Identification - historical perspective.
 - Alphonse Bertillon - Anthropometric Identification.
 - Friction ridge skin.
 - Ridge minutiae.
 - Classification systems - Vucetich versus Henry.
 - Three general pattern types - Loops, Whorls and Arches.
 - Sub-types of each explored.
 - Obtaining inked fingerprints.
 - Basis for use of fingerprints: Permanence and individuality.
 - Individuality based on Unit Relationship.

- LATENT FINGERPRINTS
 - Unintentional transfer of sweat or other secretions.
 - Eccrine and Sebaceous prints.

- Other evidential prints - Visible or Patent and Plastic or Molded.
 - Latent print development - non-porous and porous substrates.
 - Non-porous: Powder dusting, cyanoacrylate fuming, dye staining.
 - Porous: Iodine fuming, magnetic powder, ninhydrin.
- LATENT TO INKED FINGERPRINT COMPARISONS
 - Text "Ridgeology" written by Ashbaugh, 1978.
 - ACE-V protocols.
 - Analysis, Comparison, Evaluation and Verification.
 - Levels of detail.
 - Level One: General morphological information.
 - Level Two: Individual ridge events (minutiae).
 - Level Three: Edgeoscopy and Poroscopy.
 - No minimal point standard established.
- FIRE SCENE AND ARSON INVESTIGATIONS
 - Chemistry of fire - the Fire Triangle.
 - Oxidation reactions.
 - Fuel: Solid, liquid or gaseous.
 - Only gaseous state will support combustion.
 - Solids decompose and give off gas (Pyrolysis).
 - Liquids must reach "flashpoint" in order to combust.
 - Exothermic reactions.
 - Ignition point and flammable range.
 - Motives of the Arsonist.
 - Fire scene investigation.
 - Origin and cause determination.
 - Solid evidence sampling.
 - Lab analysis - Headspace technique and Gas Chromatography.
- SUSPICIOUS DEATH INVESTIGATIONS
 - Scene indications as to suspicious deaths.
 - Role of the Medical Examiner.
 - The autopsy.
 - Post mortem body changes: rigor mortis, algor mortis, lividity, putrefaction, vitreous humor.
 - Post mortem interval or time since death determination.
 - Modes of death: Shooting, cutting and stabbing, asphyxiation, poisoning and blunt force trauma.
- SKELETAL REMAINS INVESTIGATIONS
 - Forensic Anthropology / Human Osteology.
 - More common outdoors than indoors with exceptions.
 - Societal factors and demographics.
 - Post mortem interval - Accumulated Degree Days.
 - Bone inventory - adult skeleton consists of 206 bones.

- Determinations: Sex, race, stature, age, positive identification, post mortem interval and cause of death.
- Positive ID and COD commonly problematic due to soft tissue reduction.
- Role of the Forensic Odontologist.
- Ante mortem X-ray comparisons, prior medical procedures, facial reconstruction utilizing the skull.
- Post mortem interval.

Lab Outline

Week	Lab
2	Crime Scene Sketching
4	Trace Evidence – Hair and Fiber Analysis
5	Firearms Identification
6	Footwear Evidence Comparisons
7	Handwriting Analysis and Comparison
9	Latent Fingerprint Processing and Development
10	Latent to Inked Fingerprint Comparisons & Reporting
14	Forensic Anthropology / Human Osteology
15	Practical - Suspicious Death Scene Investigation

Lab Report Expectations:

- Forensic scientists must keep clear, detailed bench notes during all phases of evidence examination and analysis. These notes are “discoverable” indicating that in the event of an arrest the defense will be privy to copies of all such notes. Therefore, all laboratory reports must be written with this standard in mind.
- All lab reports must be neat, complete and include conclusions based upon the criteria presented.
- Lab exercises will be performed singularly, in pairs and in team formats depending upon the particular lab. Reporting criteria for each format will be announced by the instructor prior to each lab.
- The instructor reserves the right to refuse any lab reports which do not meet legally accepted bench note standards.