

JOHN JAY COLLEGE OF CRIMINAL JUSTICE
The City University of New York

SCI 114: Scientific Principles of Forensic Science Syllabus

City University of New York- John Jay College of Criminal Justice
524 West 59th Street, New York, NY, 10019

Science 114 Sections 1; Summer 2014

Lecture Instructors: Christopher Kluge

Laboratory Instructors: Christopher Kluge (Section 1),

Office location: Christopher Kluge – 3.62 NB

Contact hours: All instructors - by appointment.

E-mail address: Christopher Kluge - ckluge@jjay.cuny.edu;
christopher.kluge@jjay.cuny.edu

Course description:

This course is an introduction to basic scientific investigative methods used in forensic science. It is primarily laboratory based and students will examine materials for the presence of blood, analyze hair and fibers, isolate DNA, analyze soil samples, and study landmark cases in forensic science to contrast fact from fiction. To be an effective “scientific investigator,” students will learn how to apply chemistry, biology, and physics to analyze data in order to solve criminal justice problems.

[Note: this course is for non-Forensic Science majors.]

Learning outcomes:

1. Identify and apply the fundamental concepts and methods of a life or physical science.

Establish broad fundamental scientific concepts theories, and principles in physical and biological sciences, and scientific literacy by performing several laboratory experiments where students will:

- Correctly use tools for measurements and reproduce crime scenes to scale;
- Recognize the scientific method by performing laboratory experiments such as the presumptive test for blood;
- Learn to use correct terminology in a scientific setting;
- Recognize the importance of controls in a scientific experiment by running a DNA gel;
- Distinguish between accuracy and precision, and the significance of errors;
- Learn to reproduce established protocols;
- Draw appropriate scientific conclusions from evidence and experimental data;
- Understand the role of creativity in problem solving.

2. Apply the scientific method to explore natural phenomena, including hypothesis development, observation, experimentation, measurement, data analysis, and data presentation.

Accrue hands-on laboratory and practical research skills, including emphasizing the role of quality assurance, objectivity in scientific data collection and how these relate to the system of professional ethics in science. Students will:

- Study fundamental parameters such as density and the influence of mass and volume, by looking at the liquid displacement of objects of various composition;
- Outline positive and negative controls for the presumptive test of blood and DNA gel electrophoresis in order to validate their experiment.
- Make predictions on the outcome of and test theories by investigating the statistics of DNA and then apply theories of statistics into fingerprint characterization.

3. Use the tools of a scientific discipline to carry out collaborative laboratory investigations.

- Demonstrate lab safety and proper laboratory protocol while performing laboratory experiments;
- Use spot testing techniques when testing for the presence of blood;
- Discover liquid-liquid extraction when isolating DNA;
- Learn gel chromatography when identifying the origin of a DNA sample;
- Familiarize themselves with scientific databases when researching landmark forensic science cases and the impact of forensic science on society.

4. Gather, analyze, and interpret data and present it in an effective written laboratory or fieldwork report.

- Learn proper harvesting methods and gather their own samples for the hair and fiber experiment;
- Record and be able to present on demand their actions in performing laboratory experiments;
- Utilize NYC's historical and educational facilities such as museums, to expand their educational scope by visiting a forensic exhibition.
- Interpret their results and report on the identity or composition of unknown samples:
 - ◇ Presence or not of blood;
 - ◇ Discovery of controlled substances
 - ◇ Density of a material;
 - ◇ Origin of a DNA sample;
 - ◇ Typing and individualizing fingerprints.

5. Identify and apply research ethics and unbiased assessment in gathering and reporting scientific data.

- Discriminate between scientific and non-scientific resources by describing the basic components of a scientific investigation, and contrast this with non-scientific statements;
- Look at representations of forensic scientists in the media and popular culture in show such as CSI, Law and order and Dexter to compare to non-fiction scenarios.

Course pre-requisites or co-requisites:

Prerequisite: none

Requirements / Course policies:

- **EXAM POLICY:** If you are late to an exam, the exam will still be administered to you as long as no other student has left the examination room. If you arrive after a student has left without an acceptable documented excuse you will receive a zero for the exam. A documented excuse will allow you entrance to the exam; however, no extra time will be allotted. Train delays, flat tires, etc...are not acceptable excuses. A make-up exam may be given if time is short. Programmable calculators are not permitted during exams, this includes Cell/Smart phones. Bookbags, purses, etc., must be placed in the front of the room. Water bottles and the like must have their labels completely removed.
- **This class will be utilizing remote response technology.** Students are required to have a REGISTERED student response card from Turning Technologies (The ResponseCard RF) within the first two weeks of class. If the bookstore runs out of the responder cards you are heavily encouraged to preorder after the first day of class. Not having this device by the second week of class will negatively impact your grade! Registration at **student.turningtechnologies.com** and follow the on-screen instructions. The Response card will be utilized in both lecture and lab.
- Quizzes will be given in lab, using the response cards. The quizzes will be open book, but only a limited amount of time will be given for each question. There will be 5 quizzes offer in the semester, with the lowest grade being dropped.
- Attendance is required for both lecture and laboratory sections. A total of **three** or more unexcused absences will adversely affect your grade. Students are responsible for **legibly** signing the attendance sheet for the first two weeks and will considered absent if they do not. Preceding the second week, remote responses will be used to ascertain attendance and lateness. Whoever has not expressed attendance within the first 15 min or arrives later will be counted as late. **Two** lateness marks will equal **one** absence.
- Students are required to observe **all** safety rules, including wearing safety glasses during lab work and cleanup. Students without safety glasses will be barred from the lab for that period and will receive an absent mark. Students arriving late must contact the instructor at the end of the session **before** leaving the lab.
- Cell/Smart phone usage is not permitted in lab or lecture and must be turned off or placed on silent (not vibrate). Texting or messaging during class is strictly forbidden. During an exam the usage of a cell phone or texting will result in a zero for that exam. If the student needs to use the phone they can leave the room. If caught using the phone in the room the student will be asked to leave to room and upon multiple infractions may be barred from the lab for that session and marked absent. (We would not have this rule if it were not needed).
- We cannot guaranty any makeups for exams.
- Proper laboratory attire is mandatory. Deviation from the guidelines presented in the safety list will lead to a dismissal from the period and a mark of absent.
- **Failure to possess and wear lab goggles is inexcusable. Goggles are mandatory for all lab sessions including recitations! The minimum penalty for not having or wearing your goggles is a zero for the lab and dismissal from the period with a marked absence**
- Students are required to address their professors and each other with respect. This applies to in and outside of the classroom and also in electronic communications.

Required Materials:

- Forensic Science: Fundamentals and Investigations
By Anthony J. Bertino South-Western Educational Pub
ISBN-10: 0538445866
- Turning Technology Response Card
- Ticket to Power of Poison at the American Museum of Natural History (in lieu of Lab Text)

- Registration of Turnitin.com

Grading:

Lecture - 40%	Laboratory - 60%
Midterm - 15%	10 Labs @ 3% - 30%
Final - 15%	Formal Paper – 7%
5 Quizzes - 10%	Lab Practical - 15%
	Attendance - 8%

Letter grades determination.

Grade	Percentage Equivalent
A	93.0-100.0
A-	90.0- 92.9
B+	87.1- 89.9
B	83.0- 87.0
B-	80.0- 82.9
C+	77.1- 79.9
C	73.0- 77.0
C-	70.0- 72.9
D+	67.1- 69.9
D	63.0- 67.0
D-	60.0- 62.9
F	Below 60.0

1. Unknowns

There will be unknowns for some the laboratories (Density, presumptive blood, DNA, drugs, fingerprint and hair/fiber analysis). Students will be asked to confirm their abilities by identifying these unknowns in a lab practical.

Unknowns cannot be made-up due to time constraints

2. Laboratory Field Trip

Students will be required to go to the American Museum of Natural History and view “The Power of Poison” exhibition (in lieu of purchasing a laboratory manual) and complete a questionnaire and report.

3. Formal Paper

To satisfy the college writing requirement a report based on the AMNH field trip must be submitted. The paper must be typed. Please refer to the paper grading rubric for details. Grades will be determined as Good/Satisfactory/Poor.

Course Calendar:

- Week 1:** Lecture - Introduction to forensic science and the role of observation
Focus will be on the role of forensic science and the power of observation. What do we look for, how do we record it, and how we interpret it.
Associated Laboratory Exercises
Lab 1: Laboratory Safety.
Lab 2: Fathers of Forensic Science and the FBI Crime Lab
Reading/Viewing: Chapter 1 - Observation Skills
- Week 2** 1st Lecture - Crime Scene Investigations
How a crime scene gets processed and evidence handling
Associated Laboratory Exercise
Lab - Crime Scene Investigation and Evidence Collection
Reading/Viewing: Chapter 2: Crime Scene Investigation and Evidence Collection
- 2nd Lecture - Chemistry into Physical Properties: Matter - Density & Refractive Index
Brief concepts of chemistry will be discussed in an effort to explain physical properties of matter, then glass evidence will be reviewed to detail density and refractive index.
QUIZ 1 – CHAPTERS 1 & 2
Associated Laboratory Exercise
Lab - Volume, Glassware, Density
Reading/Viewing: Chapter 14 – Glass Evidence
- Week 3** 1st Lecture - Blood and Blood Stain Analysis
Focus will be on blood: to detail function, identification techniques, and blood spatter patterns
Associated Laboratory Exercise
Lab - Presumptive Blood Tests and Blood Spatter Patterns (How do blood patterns change based on substrate, angle, and velocity)
Reading/Viewing: Chapter 8 – Blood and Blood Spatter
- 2nd Lecture - Fingerprints
How to identify, individualize, and development techniques of fingerprints.
QUIZ 2 – CHAPTERS 14 & 8
Associated Laboratory Exercise
Lab - Developing fingerprints on multiple substrates, then classifying, identifying and individualizing developed fingerprints.
Reading/Viewing: Chapter 6 - Fingerprints

Week 4 Lecture – Statistics: Data doesn't exist in a vacuum, how does it all get pulled together? Students will learn about the importance of scrutinizing data and pooling information. What is valid versus invalid information? What is a statistic? How is it applied in forensic science? Simple statistical calculations will be defined, such as: Averages, standard deviations, relative standard deviations, unions, and data populations.

Associated Laboratory Exercise

Lab - Statistics with Fingerprints using Excel and Review for Midterm

Reading/Viewing: Visionlearning.com: Data: Statistics

Visionlearning.com: Data: Uncertainty, Error, and Confidence

The above videos are by *Anthony Carpi, Ph.D.*, *Anne E. Egger, Ph.D.*

Midterm – All material covered in Lecture and Lab

In lecture, the Midterm will be given

Associated Laboratory Exercises

Lab 1: Microscopy: Fundamental usage of a Microscope, Instructor lead demo.

Lab 2: Microscopy: Examination of different microscopic samples.

Week 5 1st Lecture - Hairs and Fibers Evidence

The morphology and analysis of hair and fiber evidence will be explored.

QUIZ 3 – CHAPTER 6, STATISTICS, & MICROSCOPY

Associated Laboratory Exercise

Lab - Study of 3 fibers & 3 hairs, and mounting your own hair/fiber

Reading/Viewing: Chapter 3 – The Study of Hair

Chapter 4 – A Study of Fibers and Textiles

2nd Lecture - Forensic Toxicology and Drugs

A survey of commonly encountered drugs submitted as evidence along with common methods of analyzing compounds.

Associated Laboratory Exercise

Lab - Color tests to analyze drugs as well as Thin Layer Chromatography testing as an analysis of a drug.

Reading/Viewing: Chapter 9 – Drug Identification and Toxicology

Week 6 Lecture - DNA and Forensic Classification

A brief explain the function of DNA and how it is forensically characterized and used in analysis for individualization.

QUIZ 4 – CHAPTERS 3, 4, & 9

Associated Laboratory Exercise

Lab - Isolation of DNA from cheek cells and Gel electrophoresis of DNA standards.

Reading/Viewing: Chapter 7 – DNA Fingerprinting

Power of Poison Exhibit in the American Museum of Natural History

Lecture and Lab will not be meeting this day.

Week 7 1st Lecture - Fire, Explosives, and Firearms

Students will learn about the chemistry of fires and explosions, then briefed on firearm Identification

Laboratory Exercise

Lab – Practical Session 1

Reading/Viewing: Chapter 17 - Ballistics

2nd Lecture – Forensic Anthropology and Pathology

Forensic Anthropology and Pathology will be defined, and time of death will be explored.

Laboratory Exercise

Lab – Practical Session 2

POWER OF POISONS' PAPER ARE DUE

Week 8 The CSI Effect, Forensics in the Media, and Ethics

Students will learn what is the CSI effect, how media uses literary freedom to misrepresent sound principles and explore ethically situations.

QUIZ 5 – CHAPTERS 7, 17, & Forensic Pathology

Associated Laboratory Exercise

Lab - Watch CSI Episode. Note consistencies and inconsistencies from what you have learned.

Final – All material covered after the midterm in Lecture and Lab

In lecture, the Final will be given

College wide policies for undergraduate courses (see the *Undergraduate Bulletin*, Chapter IV Academic Standards)

- A. **Incomplete Grade Policy**
- B. **Extra Work During the Semester**
- C. **Americans with Disabilities Act (ADA) Policies**

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Office of Accessibility Services (OAS). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student's eligibility from the OAS which is located at L66 in the new building (212-237-8031). It is the student's responsibility to initiate contact with the office and to follow the established procedures for having the accommodation notice sent to the instructor.

Source: *Reasonable Accommodations: A Faculty Guide to Teaching College Students with Disabilities*, 4th ed., City University of New York, p.3.

(http://www.jjay.cuny.edu/studentlife/Reasonable_Accommodations.pdf)

Statement of the College Policy on Plagiarism

Plagiarism is the presentation of someone else's ideas, words, or artistic, scientific, or technical work as one's own creation. Using the ideas or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations require citations to the original source.

Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

It is the student's responsibility to recognize the difference between statements that are common knowledge (which do not require documentation) and restatements of the ideas of others. Paraphrase, summary, and direct quotation are acceptable forms of restatement, as long as the source is cited.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The Library has free guides designed to help students with problems of documentation. (*John Jay College of Criminal Justice Undergraduate Bulletin*, <http://www.jjay.cuny.edu/academics/654.php> , see Chapter IV Academic Standards)

Plagiarism detection software - the College subscribes to Turnitin.com and Blackboard has a similar module called SafeAssign.

Science 114

Summer 2014

Lecture Schedule

Class Meetings		Lecture Topic	Readings
29-May-14	Th	Syllabus and Intro to Forensic Science	Chap. 1
3-Jun-14	T	Crime Scene Investigation	Chap. 2
5-Jun-14	Th	Chemistry and the Physical Properties of Matter	Chap. 14
10-Jun-14	T	Blood: Classification and Detection	Chap. 8
12-Jun-14	Th	Fingerprint Identification	Chap. 6
17-Jun-14	T	Statistics	Web Videos
19-Jun-14	Th	Midterm Exam	
24-Jun-14	T	The Morphology of Hairs and Fibers	Chap. 3 & 4
26-Jun-14	Th	Forensic Toxicology and Drugs	Chap. 9
1-Jul-14	T	DNA and Forensic Classification	Chap. 7
3-Jul-14	Th	Power of Poisons Exhibition: Class Cancelled	
8-Jul-14	T	The Science Behind Firearms and Explosives	Chap. 17
10-Jul-14	Th	Forensic Anthropology and Pathology	
15-Jul-14	T	The CSI Effect, Media, and Ethics	
17-Jul-14	Th	Final Exam	

Science 114**Summer 2014****Lab Schedule**

Class Meetings		Laboratory Exercises
29-May-14	Th	Safety and the Fathers of Forensic Science
3-Jun-14	T	Crime Scene: Collection of Evidence & Sketch
5-Jun-14	Th	Quiz 1 Density, Volume, and Compositions
10-Jun-14	T	Presumptive Blood Test and Blood Spatter Analysis
12-Jun-14	Th	Quiz 2 Detection and Classification of Fingerprints
17-Jun-14	T	Fingerprint Analysis and Data Propagation / Review Midterm
19-Jun-14	Th	Introduction to Microscopy
24-Jun-14	T	Quiz 3 Hairs and Fibers - A Microscopic Examination
26-Jun-14	Th	Drugs and Chromatography
1-Jul-14	T	Quiz 4 DNA Isolation and Electrophoresis
3-Jul-14	Th	Power of Poisons Exhibition: Class Cancelled
8-Jul-14	T	Practicum (Week 1)
10-Jul-14	Th	Practicum (Week 2) Power of Poisons Paper Due
15-Jul-14	T	Quiz 5 CSI Episode: Consistencies and Inconsistencies / Review Final