Marshall University Syllabus
Master of Science in Forensic Science

Course

FSC 628 Chemical Analysis of Trace Evidence

Course Description

This course is a continuation of FSC 622, Forensic Analytical Chemistry. The emphasis of this course is the analysis of trace evidence materials including paint and polymers, fibers, glass, fire debris, gunshot residue, explosives, and general chemical unknowns. Instrumental techniques commonly utilized in forensic laboratories for chemical analysis of these trace materials will be covered. This is a required course for the Forensic Chemistry emphasis of the MS Forensic Science degree.

Credits

2 graduate credit hours

Prerequisites

FSC 622 and FSC 623 – Forensic Analytical Chemistry (Lecture and Laboratory)

Term/Year

Spring 2025

Class Meeting Days/Times

Students are required to attend the lecture session and 1 laboratory session as assigned.
Lectures: Mondays 1:00 – 2:50 PM
Laboratory: Tuesdays 12:30 – 2:20 PM

Location

Lectures: Forensic Science Center Annex Classroom 115
Laboratory: Forensic Science Center Annex Chemistry Laboratory 221

Academic Calendar

For beginning, ending, and add/drop dates, see the Marshall University Academic Calendar (URL: https://www.marshall.edu/academic-calendar/).

Instructors

Dr. Lauren Waugh
Dr. Kim Kunkler

Instructor's Contact Information

Dr. Lauren Waugh:

- Office: WW 200EE
- Office Hours: Mondays, Tuesdays, & Thursdays 10 AM – 12 PM

- Office Phone:
- Marshall Email: richards18@marshall.edu
- Personal Cell: 412-445-7690

Dr. Kim Kunkler:

- Office: Forensic Science Center Annex Room A225
- Office Hours: Mondays 11:00 AM – 12:00 PM; Tuesdays 9:00 AM – 11:00 AM; Wednesdays 1:00 PM – 4:00 PM; and by appointment.
- Office Phone: 304-733-7864
- Marshall Email: kunkler@marshall.edu
- Personal Cell: 217-891-3273 (please use wisely)

Health and Safety Information

All members of the Marshall University community are expected to observe all health and safety protocols. This includes general health and safety protocols as well as specific protocols that might emerge in response to community and campus health conditions.

Campus Carry Policy

University Policy, UPGA-12 (Campus Carry Policy) derives its authority from West Virginia State law, including the Campus Self-defense Act (W. Va. Code § 18B-4-5b). It pertains to the exercise of Concealed Carry on Marshall University's campus, except in designated areas, by individuals with a valid permit to Conceal Carry.

Individuals who choose to Conceal Carry are responsible for knowing and understanding all applicable federal, state, and local laws and Marshall University Board of Governors Rules, University Policies, and Administrative Procedures. University Policy, UPGA-12 applies to areas of campus and buildings that are directly under the possession or control of Marshall University.

Concealed handguns are not observable to others and must be holstered and concealed on the body of the permit holder or in a personal carrier, such as a backpack, purse, or other bag that remains under the exclusive and uninterrupted control of the permit holder. This includes wearing the personal carrier with a strap, carrying or holding the personal carrier, or setting the personal carrier next to or within your immediate reach at all times. If your participation in class activities impedes your ability to maintain constant control of your handgun, please make alternate arrangements prior to coming to class.

Required Texts and Materials

None.

Recommended/Optional Texts and Materials

Bell, S. (2022) *Forensic Chemistry*, Third Edition. CRC Press: Boca Raton, FL.

Evans-Nguyen, K.; Hutches, K., Eds. (2019) *Forensic Analysis of Fire Debris and Explosives*. Springer Nature: Switzerland.

Caddy, B., Ed. (2001) *Forensic Examination of Glass and Paint: Analysis and*

Interpretation. Taylor & Francis: New York, NY.

Excerpts from relevant ASTM standards will be referenced and made available for personal use and study by the students during this course.

Course Student Learning Outcomes

The table below shows the following relationships: How each student learning outcome will be practiced and assessed in the course.

Course student learning outcomes	How students will practice each outcome in this course	How student achievement of each outcome will be assessed in this course
Students will describe the use of trace materials within forensic investigations	Class discussions, laboratory work	Homework assignments Exams Laboratory activities
Students will discuss observable and measurable characteristics of trace materials	Class discussions, laboratory work	Homework assignments Exams Laboratory activities
Students will discuss the theoretical principles and practical implementation of instrumental techniques used to analyze trace materials evidence	Class discussions, laboratory work	Homework assignments Exams Laboratory activities
Students will demonstrate ability to analyze trace materials and related samples using instrumental techniques	Class discussions, laboratory work	Laboratory activities Instructor observations
Students will interpret instrumental data obtained from trace materials and related samples	Class discussions, laboratory work	Homework assignments Exams Laboratory activities
Students will review published, consensus-based standards and define basic terminology related to forensic trace materials analysis	Class discussions, laboratory work	Homework assignments Exams Laboratory activities
Students will articulate the strengths and weaknesses of various techniques involved in forensic trace materials analysis	Class discussions, laboratory work	Homework assignments Exams Laboratory activities
Students will apply quality assurance and quality control practices related to forensic trace materials analysis	Class discussions, laboratory work	Instructor observations Laboratory activities
Students will prepare appropriate responses for testimony questions related to forensic trace materials analysis	Class discussions, laboratory work	Homework assignments Exams Laboratory activities

Course Requirements/Due Dates

Grading is based on student performance on 3 homework assignments, 2 exams, and 4

laboratory activities. Contributions of each of these toward the final grade, and the dates they are due, are summarized in the table below.

Assignment	Points Toward Final Grade	Due Date / Time
Homework 1	5	February 3 / 1:00 PM
Homework 2	5	February 25 / 12:30 PM
Homework 3	10	April 21 / 1:00 PM
Exam 1	20	March 3 / 1:00 PM
Exam 2	20	May 5 / 1:00 PM
Lab 1	10	February 11 / 12:30 PM
Lab 2	10	March 25 / 12:30 PM
Lab 3	10	April 8 / 12:30 PM
Lab 4	10	April 29 / 12:30 PM

Total Points Possible: 100

Grading Policy

Grading Scale: A = 90 to 100 points
B = 80 to 89 points
C = 70 to 79 points
D = 60 to 69 points
F = 0 to 59 points

Partial Credit Policy: Partial credit amounts to both give and take; students can earn partial credit for the correct portions of an answer, but they can also lose partial credit for adding incorrect or misleading information to an otherwise fully correct answer.

Late Grading Policy: A 10% deduction will be taken for every day an assignment is late.

Attendance/Participation Policy

Attendance is Mandatory: Students enrolled in the Forensic Science Program are expected to attend all classes, laboratories, seminars, internship sessions, and presentations offered by guest speakers. Should you need to miss classes due to an excused absence or other situation governed by the official health or safety policy, appropriate accommodation will be provided.

Excused Absences: Both notification and formal documentation are required for Excused Absences. No exams, labs, or other formal exercises will be made up without an Excused Absence. With an Excused Absence, the student may be asked to take an exam BEFORE the scheduled date.

Unexcused Absences: Any unexcused absence in which a student misses a graded activity or assignment identified in this syllabus may result in a zero for the activity or assignment.

Punctuality: On-time arrival is expected of all students. A deduction of 10 points will be made if a lack of punctuality is persistent (more than 3 times during the semester).

Generative Artificial Intelligence (AI) Use Policy

Students are allowed to use Generative AI in some ways but are prohibited from using it in other ways. Keep in mind that any content produced by generative AI can "hallucinate"

(produce false information), so students are responsible for ensuring the accuracy of any AI-generated content. For information on citing AI, please see **MU Library's AI citation website** (URL: https://libguides.marshall.edu/plagiarism-AI/cite). Students should not use generative AI in any way that would violate the **Student Code of Conduct** (URL: https://www.marshall.edu/student-conduct/).

Students are permitted to use generative AI in the following ways:

- **Brainstorming**: You may use generative AI to stimulate creativity, generate ideas, or brainstorm topics for papers, presentations, and discussions. The generated content must serve as a stepping stone, not a final product.
- **Citation Assistance**: AI tools can be used to manage, format, and organize citations and references, promoting adherence to academic writing standards and specific style guides required for individual assignments.
- **Grammar and Style Checking**: AI-powered writing enhancement tools may be used to help with spelling, grammar, syntax, and stylistic errors.
- **Concept Understanding**: Generative AI can be used to explain or simulate concepts taught in class, aiding in a deeper understanding.
- **Research Assistance**: AI can be used to conduct initial literature searches, compile citation data, and summarize articles, books, or papers. It should not replace traditional background research methods but rather enhance them.

Students are <u>not</u> permitted to use generative AI in coursework in the following ways:

- **Plagiarism**: Using AI-generated content as your original work without attribution. This includes essays, papers, presentations, and exam answers.
- **Data Manipulation**: Using AI tools to alter data or create misleading information.
- **Misrepresentation of Skills**: Using generative AI to complete tasks that are meant to assess your knowledge and skills.
- **Confidentiality Breach**: Using AI tools that might violate university policies or laws related to data privacy and confidentiality.

See individual assignment instructions for any additional details.

In addition to a proper citation, the student should include the following statement with any assignment where generative AI is used for assistance:

"I used generative AI platform [INSERT NAME OF PLATFORM, SUCH AS CHAT GPT] for assistance in the following ways on this assignment: [INSERT WAYS USED, such as brainstorming, citation assistance, grammar and style checking, concept understanding, and research assistance, etc.]."

University Policies

By enrolling in this course, you agree to the University Policies. Please read the full text of each policy (listed below) by going to MU Academic Affairs: University Policies. (URL: https://www.marshall.edu/academic-affairs/policies/)

- Academic Dishonesty Policy
- Academic Dismissal Policy
- Academic Forgiveness Policy

- Academic Probation and Suspension Policy
- Affirmative Action Policy
- Pre-Finals Week Policy
- D/F Repeat Rule
- Inclement Weather Policy
- Sexual Harassment Policy – Title IX prohibits the harassment of students based on sex, which includes pregnancy, childbirth, and related conditions. This includes that students will not be penalized for taking medically necessary leave related to pregnancy, childbirth, or related conditions. Marshall's Title IX Office may be contacted at TitleIX@marshall.edu
- Students with Disabilities (Policies and Procedures)
- University Computing Services Acceptable Use Policy

Laboratory Safety

The laboratory activities are designed to be as safe as is practical. However, if you have a medical condition (e.g., asthma, pregnancy) that might be exacerbated or jeopardized by exposure to reagents or test substances, please confer with the Instructor in confidence as soon as possible so that alternative arrangements can be made.

You will be required to sign a safety orientation acknowledgment during your first lab period. Your signature on this document acknowledges (1) that you have read the "Safety & Annual Training" section of the *FSC Graduate Student Handbook*, (2) that you have taken the on-line lab safety courses required by FSC, (3) that you have reviewed the *Marshall University Environmental Health and Safety Manual* and will comply with its provisions, and (4) that your instructor has reviewed with you the following topics: general lab safety guidelines, fire alarm procedures, and the location and use of personal protective equipment (PPE), fire extinguishers, chemical spill kits, safety shower, and eye wash.

Proper Laboratory Attire

Personal protective equipment (PPE; e.g., safety glasses, chemical splash goggles, lab coats, gloves) will be available in a variety of sizes and must be worn as appropriate for the tasks being performed. For your safety, you will not be permitted to wear shorts or open-toed shoes in the lab. Tie back or confine long hair.

Course Schedule

While every effort will be made to adhere to the following course schedule (see next page), the topics and order of presentation are subject to change.

Course Schedule for FSC 628 Spring 2025:

Week	Lecture (Mondays)	Lab Exercise (Tuesdays)
1	1/13 Welcome / Course Logistics PP01 Intro to Trace **Homework 1 assigned**	1/14 Intro Lab: Lab Safety, Trace Collection & Preservation Techniques
2	1/20 **NO CLASS** (MLK Jr. Day)	1/21 Lab 1: Fire Debris (week 1)
3	1/27 PP02 Fire Debris 1	1/28 Lab 1: Fire Debris (week 2)
4	2/3 PP03 Fire Debris 2 **Homework 1 due** **Homework 2 assigned**	2/4 Lab 1: Fire Debris (week 3)
5	2/10 PP04 Fibers	2/11 Open **Lab 1 due**
6	2/17 **NO CLASS** (2025 AAFS)	2/18 **NO LAB** (2025 AAFS)
7	2/24 PP05 Paint & Polymers 1	2/25 Lab 2: Fibers (week 1) **Homework 2 due by 12:30 PM on 2/25**
8	3/3 **Exam 1**	3/4 Lab 2: Fibers (week 2)
9	3/10 PP06 Paint & Polymers 2 **Homework 3 assigned**	3/11 Lab 2: Fibers (week 3)
---	3/17 **NO CLASS** (Spring Break)	3/18 **NO LAB** (Spring Break)
10	3/24 PP07 Gunshot Residue	3/25 Lab 3: Paint (week 1) **Lab 2 due**
11	3/31 PP08 Explosives 1	4/1 Lab 3: Paint (week 2)
12	4/7 PP09 Explosives 2	4/8 Lab 4: Explosives (week 1) **Lab 3 due**
13	4/14 PP10 Glass	4/15 Lab 4: Explosives (week 2)
14	4/21 PP11 General Chemical Unknowns **Homework 3 due**	4/22 Lab 4: Explosives (week 3)
15	4/28 Review for Exam 2 Course Reflections	4/29 Open **Lab 4 due**
EXAMS	**5/5 1:00 PM - Exam 2**	