

FRNSC 831 – Forensic Chemistry II (Laboratory)

Fall 2018

Learning Objectives and Outcomes
This course builds upon the knowledge and skills you have learned from your undergraduate and graduate level courses in order to acquire an advanced level of investigation into the chemical and physical properties of drug substances and other forensically relevant materials.
Proposed Laboratory Modules **
<p>The laboratory is divided into four modules.</p> <ul style="list-style-type: none">(i) extraction and analysis of psychoactive compounds from a plant material(ii) investigation into breath alcohol analysis methods(iii) synthesis and analysis of a psychoactive compound(iv) method development and quality control <p>** The planning, availability of chemicals and equipment, PPE, level of student preparation to execute the protocols safely, and overall safety and physical constraints are taken into consideration as to whether these modules will or will not be performed. Substitution of these modules with other ones are at the discretion of the instructor.</p>
Examples of Laboratory Modules
<p>Extraction and analysis of psychoactive compounds from a plant material</p> <p>The source of the plant material can be tobacco (nicotinamides), tea leaves (theophylline, caffeine), coffee beans (caffeine), or morphine from unwashed poppy seeds. Other plant material can be considered after consultation with the Instructor. The extraction method will be developed by the student investigator using knowledge of the chemical and physical properties of the compound in question. After isolation of the psychoactive compound, the yield and purity will be analyzed with the methods that are available. Throughout the process, the student investigator will learn what methods work and do not work, the safety issues that need consideration, and explanations for the yield along with discussion of the improvements that can be made. A procedural write up will be used for the method development as well as replication of the developed extraction procedure that will be conducted by another student.</p>
<p>Investigation into breath alcohol analysis methods</p> <p>After understanding the chemical reaction underlying the breathalyzers, an investigation into the performance, reliability, and potential interferences with the chemical reaction is investigated.</p>
<p>Synthesis and analysis of a psychoactive compound</p> <p>An objective of this module is to identify the skills and knowledge required to synthesize a psychoactive compound from ingredients and equipment that are readily available to the general public. This module requires creativity, innovation, and ability to think constructively and out-of-the-box.</p> <ul style="list-style-type: none">(a) aspirin from salicylic acid(b) acetaminophen from p-aminophenol(c) methamphetamine from pseudoephedrine (both DEA Schedule II)

FRNSC 831 – Forensic Chemistry II (Laboratory)

Fall 2018

Method development and quality control

This module educates the scientist on identifying and understanding the parameters in method development using analytical instrumentation. The primary instrument will be a chromatographic system, either LC or GC.

Presentations/Discussion

There will be weekly group discussions on Fridays (typically from 10:30 am until 1 pm, tentatively in 333 Whitmore) during class time to present ideas, encourage creative thought, demonstrate progress, group discussion, troubleshooting of problems encountered during the process, and arriving at solutions to these problems.

Laboratory Resources

Some experiments may have gas-producing chemical reactions and you will be required to have a lab jacket and eye protection.

Grading (Metrics/Rubrics)

The grade is not based on the success or failure of the experiments. What is graded is the participation in the learning experience, the willingness to learn these new skills and knowledge, and the development of problem solving skills. Understanding the parameters and the complexity of the extraction and synthesis process are taken into account. The ability to reason, to troubleshoot, and to resolve the problems encountered are also taken into consideration for the grading process.

The laboratory section will be weighted as 25% of the overall course grade in consultation with Dr. Frank Dorman.

Point assignments (250 points, subject to adjustment):

- **50 points – participation in the learning experience.** The student demonstrates enthusiasm for the subject matter and strives to find novel approaches methods for learning more about the topics.
- **50 points – learning new skills and knowledge.** The student demonstrates successful retention of knowledge and skills acquired through reading materials, online videos, and hands-on laboratory work.
- **50 points – demonstrating ability to solve problems in the laboratory.** The student demonstrates problem solving ability by properly interpreting data (e.g., mass spectra), deductively reasoning both good and poor data/results, and advancing ideas to overcome challenges in the experiments.
- **50 points – preparation and presentation skills.** The student demonstrates effective communication abilities through oral and written presentations as well as demonstrating the appropriate level of preparation for each lab/class session.
- **50 points – overall performance.** This metric captures the level of attentiveness to safety, details of experimentation, and ability to put the subject matter in the proper forensic perspective.

FRNSC 831 – Forensic Chemistry II (Laboratory) Fall 2018

Example of typical laboratory work week

Wednesdays from 10:05 am to 1:10 pm – work on laboratory synthesis, extraction, work up, or cleaning/drying of compounds.

Fridays, from 10:05 (or 10:30) am until 1 pm – will alternate between laboratory work (extended laboratory hours are most likely possible and made available on Fridays), and lab meetings/presentations.