Colorado State University
Spring Session 2025

CHEM 442
Chemistry of Hemp & Cannabis
Studio (Lecture & Laboratory) Course Syllabus

Laboratory Location: Yates 503

Instructor: Dr. Joseph DiVerdi
Office Location: Yates 504A
Email Address: joseph.diverdi@colostate.edu
Office Phone: 970.980.5868
Office Hours: M 1:00 PM – 2:00 PM
R 11:00 AM – 12:00 PM
F 1:00 PM – 2:00 PM or by appointment
Office Hour Location: Yates 501 – 504

Studio Course Hours: MR: 12:00 PM – 2:30 PM

Instruc tional Observer: Dr. Britteny Morgan
Email Address: britteny.morgan@colostate.edu

Course Purpose: Upon successful completion of this course the student will be able to:
(1) describe the basic chemistry and pharmacology of cannabis compounds including psychoactive and non-psychoactive components;
(2) understand and perform chemistry techniques used for cannabis analysis and research;
(3) understand and perform the methods of isolation and separation of the component families under safe conditions;
(4) recognize and describe the structure activity relationships the various cannabinoids and their pharmacokinetics in humans;
(5) critically review and assess multiple types of literature on cannabis topics;
(6) consider social, legal and commercial issues within the context of chemical principles.

Course Topics: background on cannabis botany; foundational plant chemistry and cannabis differences; chemical categories in cannabis: terpenes, terpenoids, waxes and cannabinoids - structures and properties; entourage effect; gas chromatographic (GC) methods and high performance liquid chromatographic (HPLC) methods of analysis; role of derivatization in analysis; extraction methodologies; pharmacokinetics and pharmacodynamics of cannabinoids; purpose and utility of standard operating procedures in this field.

Prerequisites: Previous enrollment in chemistry Foundations Courses (general chemistry, CHEM 120/121 or 111/112/113; organic chemistry, CHEM 241/242 or 245/246 or 341/343/344; analytic chemistry, CHEM 231/232 or 334/335 or equivalent. Additionally, the student must be twenty-one (21) years of age on or before the first day of the course semester. Biological chemistry or biochemistry, CHEM 321/322 or BC 351 are recommended yet not required.

Textbook: There is no required textbook. Recommended text: Handbook of Cannabis 2014 Roger Pertwee, Ed. Oxford University Press. Readings will be regularly distributed online to students.

Academic Policies & Integrity: The University's policies on Students' Responsibilities and Rights including Personal Integrity, Academic Integrity and related areas are presented at http://catalog.colostate.edu/, especially as described in Section 1.6 on "Policies and Guiding Principles". These policies will be followed in this course. The short of it is compactly contained in the Honor Pledge:

"*I will not give, receive or use any unauthorized assistance.*"

Assistance from colleagues, experts and other sources is authorized but a threshold exists above which the assistance must be cited. This will be discussed (at some length) in the laboratory sessions.

Additional information on University policies on course registration, add/drop, withdraw and incomplete grades can be found at http://www.catalog.colostate.edu/, especially as described in Section 1.7 on "Advising and Registration". These policies will be followed in this course also.

Web-based Course Tools: http/:canvas.colostate.edu/. As a registrant of this course, the student can access its site and must do so to view announcements, receive grades and submit laboratory report and presentation files. Experimental descriptions are available at https://diverdi.colostate.edu/.

Course Plan & Organization: Twice per week there will be one (1) hour of lecture immediately followed by one and one-half (1.5) hours of laboratory. All the students will meet as a single group in both the lecture and laboratory. The teaching mode will be a combination of lecture, discussion and hands-on experience. Supplementary readings, provided electronically, will comprise significant information sources as will laboratory data collected by the students themselves. Students will perform analysis and extraction actual samples obtained from university-sanctioned sources. A field trip to post-harvest production facilities will be included.

Laboratory Notebook: Each student will create and maintain a Laboratory Notebook throughout this Laboratory course and is required to obtain a bound book for this purpose. It is best used as both a journal (or laboratory diary, if you will) and a workbook. This Laboratory Notebook will be reviewed and a grade applied to it based on the customary requirements for a laboratory notebook.

File Submissions: A professional style for the names of files submitted is required. Use lower case exclusively Use your last name only. Do not write out the report or presentation title – literally write "report" or "presentation." Use the following format for Laboratory Reports and for Oral Presentations submitted in this course, respectively:

"*442_your_last_name_report_#1.pdf*"
"*442_ your_last_name_oral_presentation.pdf*"
"*442_ your_last_name_SOP.pdf*"

Oral Presentation: Each student will make a formal oral presentation of one of the Laboratory Experiments and Laboratory Reports. The choice of the Experiment to be used in the Oral Presentation will be made by the student in consultation with and with the approval of the Laboratory Instructor. A projector and companion computer will be set up in a classroom for presentations and a laser pointer will be provided. Students will bring their presentations on their own USB disks in **PDF format only** (no other format will be accepted). Students will make a presentation in their regularly scheduled section. Each student will be allocated fifteen (15) minutes in which to make a presentation. The presentation order will be reverse alphabetical (using the last name) and all students are expected to be present for all presentations. Students will be expected to make a serious oral presentation at an upper division university level on a topic of chemistry. Students are strongly advised to review their PDF files and practice their presentations prior to making them in class where they will be assessed and graded.

Grades: Each student's final course grade will be based on the scores earned on (1) two Reports (each worth 100 points), (2) one Standard Operating Procedure (SOP), (3) the Oral Presentations (worth 100 points) and (4) the Laboratory Notebook (worth 100 points). The final course grade will be based on the number of points earned out of a possible 500 points. The final letter grade issued will be based on breakpoints set by the Laboratory Instructor in the final earned point distribution.

The Oral Presentation must be made and the slides must be submitted (as a PDF file) coincident with the delivery of the presentation. Failure to complete both of these tasks at the appointed time will result in a failing course grade, that is, "F."

No extra credit or alternate grading schemes will be offered or issued. (DEA) Final course grades will be issued from the following list: A, B, C, D or F. No "plus" or "minus" values for the final course grade will be issued. (DEA) There will be no written examinations, including a final examination, in this course.

Laboratory Safety: The physical safety in the laboratory of all personnel including students, GTAs and faculty is of paramount importance. Proper laboratory dress and conduct are required at all times. Students are required to secure and use their own approved (!) protective eyewear. There are no "loaners" available in the laboratory. Additionally, students are required to be suitably attired in the laboratory according to the clearly and previously identified in the lower division laboratory courses at all times. Lastly, professional and courteous conduct is required at all time. Students failing to abide by any of these requirements will be summarily ejected from the laboratory without provision for making up any experimental work missed and without any special consideration in the evaluation and grading of the corresponding submitted materials.

Course Topic Schedule:

Course Schedule		
Week Beginning	Topic	Notes
20 Jan	Course Introduction chemical composition of cannabis structures of Terpenes, cannabinoids & waxes	
27 Jan	Physical properties of Terpenes, Cannabinoids & Waxes; Principles of Extraction & Separation	
3 Feb	pharmacology of THC; dose response; receptors; angonists (partial, inverse)	
10 Feb	analytical techniques and standards in the hemp & cannabis industries	
17 Feb	analytical techniques and standards in the hemp & cannabis industries	#1 Report Due
24 Feb	medicinal properties of cannabis; FDA approved pharmaceuticals; unapproved commercial products	
3 Mar	product formulation; flower, extracts, oils, edibles, beverages	
4 Mar	Fertilizer formulations	
10 Mar	medicinal properties of cannabis - selected topics of interest integrated with peer - reviewed and other evidence (peer - reviewed work; steps in drug development); anandamide and other endocannabinoids	#2 Report Due
17 Mar	University Holiday	
31 Mar	structure, development and formulation of standard operating procedures	
7 Mar	structure, development and formulation of standard operating procedures	
14 Apr	analytical techniques and standards in the hemp & cannabis industries	SOP Due
21 Apr	Literature on pharmacology of THC and CBD; rigor and reproducibility; entourage effects; endocannabinoids	
28 Apr	Presentation on Presentations Laboratory Notebook Evaluation	
5 May	Oral Presentations	Oral Presentation File Due
12 May	Final Examination Week	No final examination

University Activity Conflicts: Any student having a conflict with this Schedule as the result of scheduled University Activities is asked to inform the Instructor via e-mail during the first week of the semester. The options will be reviewed at that time and accommodations will be made, both as provided for by University Policy. Otherwise, students are expected to executing according to the Schedule presented in this Syllabus.