



SYLLABUS

FDSCTE 7610

Instrumental Analysis 1 – Chromatographic & Spectroscopic
Techniques in Food Analysis (3 credit hours)

The Ohio State University
Autumn Semester 2020

COURSE OVERVIEW

Instructor

Instructor: Luis E. Rodriguez-Saona
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Phone number: 614-292-3339
Office hours: You may make an appointment or drop in.

Prerequisites

Graduate level standing, or permission of instructor.

Course description

Chromatography is a widely used technique for separation and analyses of foods. We will provide a review of the principles of chromatography, chromatographic techniques, modes of operation, sampling, practical applications and hyphenated systems.

Spectroscopic techniques have come to be regarded as attractive and promising analytical techniques for monitoring food processes, quality and safety. Advances in instrumental developments, computers and development of appropriate chemometric procedures have found applications of spectroscopic techniques in the fields of chemistry, drugs, the agro-food sector, life sciences and environmental analysis. This course will present the characteristics, advantages, limitations and potential of common spectroscopic techniques with special emphasis on food applications for process (on-line) control and in laboratories for the analysis of major or minor compounds. Through lectures and laboratory exercises, the course will introduce the students to the most widely used chromatography and spectroscopic techniques.

Course learning outcomes

The main learning outcome of this course is to make the student familiar with the basic concepts of chromatography and spectroscopy utilized for food analysis. The course is designed to give the student basic theoretical background and hands-on experience with chromatography (GC and HPLC) and vibrational spectroscopic techniques such as NIR, IR, and Raman spectroscopy. The course will emphasize practical use of chromatography and spectroscopy and discuss problems, pitfalls and tricks of the trade in relation to qualitative and quantitative use of these analytical techniques within the food science field.

1. Understand the fundamentals of chromatography and spectroscopy principles, instrumentation and advantages and disadvantages of the techniques
2. Perform data acquisition, interpret measurements and perform qualitative and quantitative analysis on selected foods.
3. Understand matrix effects.
4. Evaluate the performance of these techniques for rapid and routine analysis as compared to reference methods.
5. Be capable of designing and conducting experiments and encourage critical thinking.

COURSE MATERIALS AND TECHNOLOGIES

Textbooks

Chromatography: Concepts and Contrasts. James M. Miller (Author), second edition, Wiley-Interscience; 2004.

Food Analysis by HPLC. Leo M.L. Nollet (Editor). Second Edition, CRC Press; 2000

Applications of Vibrational Spectroscopy in Food Science, 2 Volume Set. Eunice Li-Chan (Editor), John Chalmers and Peter Griffiths (Co-Editors). John Wiley & Sons Ltd. Chichester, England. 2010.

Infrared and Raman Spectroscopy of Biological Materials (Practical Spectroscopy). Hans-Ulrich Gremlich and Bing Yan (Eds). Marcel Dekker, NY, USA. 2001

Molecular Fluorescence: Principles and Applications. Bernard Valeur (Author). Wiley, Chichester, England. 2007.

Modern Raman Spectroscopy: A Practical Approach. Ewen Smith and Geoffrey Dent (Authors). John Wiley & Sons Ltd. Weinheim, Germany. 2005.

Fourier Transform Infrared Spectrometry (Chemical Analysis: A Series of Monographs on Analytical Chemistry and Its Applications). Peter Griffiths and James A. De Haseth (Authors). John Wiley & Sons Ltd. NJ, USA. 2007.

Handbook of Near-Infrared Analysis, Third Edition (Practical Spectroscopy). Donald A. Burns (Editor), Emil W. Ciurczak (Editors). Marcel Dekker, NY, USA. 2001.

Course technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** <http://ocio.osu.edu/selfservice>
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

GRADING AND FACULTY RESPONSE

How your grade is calculated

ASSIGNMENT CATEGORY	POINTS
Attendance	5
Quizzes	35
Student Presentation & term project	60
Total	100%

*Please refer to Carmen for due dates of assignments.

Grading scale

93–100: A
 90–92.9: A-
 87–89.9: B+
 83–86.9: B
 80–82.9: B-
 77–79.9: C+
 73–76.9: C
 70–72.9: C-
 67–69.9: D+
 60–66.9: D
 Below 60: E

Faculty feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call **614-688-HELP** at any time if you have a technical problem.)

- **Grading and feedback:** For large assignments, you can generally expect feedback within **14 calendar days**.
- **E-mail:** I will reply to e-mails within **48 hours on school days**.

PARTICIPATION AND ATTENDANCE

Student participation requirements

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** As if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)

OTHER COURSE POLICIES

Academic integrity policy

OHIO STATE'S ACADEMIC INTEGRITY POLICY

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's *Code of Student Conduct*, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's *Code of Student Conduct* is never considered an "excuse" for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- The Committee on Academic Misconduct web pages ([COAM Home](#))
- *Ten Suggestions for Preserving Academic Integrity* ([Ten Suggestions](#))
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu

Your mental health

A recent American College Health Survey found stress, sleep problems, anxiety, depression, interpersonal concerns, death of a significant other and alcohol use among the top ten health impediments to academic performance. Students experiencing personal problems or situational crises during the quarter are encouraged to contact the College of Pharmacy Office of Student Services in room 150 Parks Hall (614-292-5001) OR OSU Counseling and Consultation Services (614-292-5766) for assistance, support and advocacy. This service is free and confidential.

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Requesting accommodations

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- [Carmen \(Canvas\) accessibility](#)
- Streaming audio and video
- Synchronous course tools

COURSE SCHEDULE

Week Number	Topics
1	Introduction
1,2	Chromatographic techniques - Some theoretical elements <ol style="list-style-type: none"> Analytical characteristics Instrumental (HPLC & GC) characteristics Solid phase Extraction in Sample preparation
3,4	Vibrational spectroscopic techniques - Some theoretical elements <ol style="list-style-type: none"> Near-infrared Mid-infrared Raman Microspectroscopy
5	Chemometrics (Quantitative and Qualitative Analysis)
6	Food Sensors
7	Student Presentations

TERM PROJECT REPORT

Every student will have hands-on experience on sample preparation, chromatography and spectral data acquisition and chemometric analysis and prepare a term project based on their results. Each student or teams (as determined by the instructor) will present a final term project report summarizing their results following scientific format, based on the Journal of Food Science guidelines for manuscript preparation. It will include the following sections:

FULL TITLE - be concise

NAME(S) OF AUTHOR(S)

AUTHOR AFFILIATION(S) with complete address(es)

(including complete mailing address, telephone, and electronic mailing address)

ABSTRACT:

State what was done, how it was done, major results, and conclusions in 200 words or less. Do not cite references. Include five (5) key words.

INTRODUCTION

In one page or less (double spaced), review pertinent work, cite key references, explain importance of research, and state the objectives of your work.

MATERIALS & METHODS

Provide sufficient detail so work can be repeated. Use subheads for clarity. Define abbreviations and acronyms. Do not repeat what is already written in the lab manual (cite the manual as a reference), but make a clear note of any changes to material or methods/procedures that YOU and YOUR group might have made

RESULTS & DISCUSSION

This section summarizes what you learned in the laboratory and by analysis of your results. Present and discuss results concisely, using figures and tables as needed (but not the same information in both figures and tables). Compare results to those previously reported, and indicate what new information is contributed herein. Make sure each table, graph or plot has a clear title, is numbered, all axes or columns and rows are clearly labeled and all units are clearly designated.

CONCLUSION

State conclusions (do not summarize) briefly.

REFERENCE(S)

List *only* those references cited in the text (be sure references list all text citations). Check JFS Style Guide for required format of references.

LABORATORY POLICY AND GENERAL INFORMATION

1. Lab Sessions

- Read lab material before coming to lab, prepare data tables and calculations as needed
- record all data and observations in bound lab notebook
- clean your bench area and the area around any lab equipment used **ESPECIALLY** balances after use

2. Safety

- wear eye protection when advised by instructors
- NEVER wear contact lenses in lab
- No eating, drinking, chewing gum or pipetting by mouth in the lab
- Label all tubes, beakers and flasks used with:
Name of Substance / Solvent
concentration / your initials
- Use appropriate waste containers
- Wear gloves when handling chemicals and samples

3. Cleanup

- clean all glassware used in lab, rinse with DI water and leave in lab cart to dry
- wipe down your bench area with sponge

- clean around balances and spectrophotometers if used

4. Lab Notebooks

- notebook must be permanently bound: spiral notebooks, essay books, or standard lab notebooks are acceptable
- notebooks must be available for inspection by TA or professor at any point during class
- record all necessary data and observations made during lab in your lab notebook; it is always better to record too much rather than too little. Remember, this is your main reference for preparing your laboratory reports

5. Lab Report

- must be word processed or typed
- all graphs and plots must be prepared using a Spreadsheet program such as Excel
- format and grading scale are given on the following page.

6. Equipment Use and Manuals

- the first time a piece of equipment is used in a laboratory session the TA will demonstrate its proper use following the equipment manual