

UNIVERSITY OF CALGARY
DEPARTMENT OF CHEMISTRY
COURSE SYLLABUS
FALL 2019

1. COURSE: CHEMISTRY 515 – Advanced Instrumental Analysis

LEC	DAYS	TIME	ROOM	INSTRUCTOR	OFFICE	PHONE	EMAIL	OFFICE HOURS
L01	MWF	09:00-09:50	ST 129	Dr. Osthoff	SB 205	220-8689	hothoff@ucalgary.ca	TR 12-1

Course website or Desire 2 Learn (D2L) course name: <https://d2l.ucalgary.ca/d2l/home/278273>
 Departmental Office: SA 229, 220-5341, chem.undergrad@ucalgary.ca

2. TEXTBOOK:

"Instrumental Analysis", **R.M. Granger** et al., Oxford University Press, University of Calgary Custom Edition Chem 515 (2019).

RECOMMENDED TEXTBOOKS:

"Principles of Instrument Analysis", **D.A. Skoog** et al., Brooks Cole, 6th ed. (2006); Cengage 7th ed. (2018).

"Building Scientific Apparatus", **J.H. Moore** et al., Cambridge University Press, 4th ed. (2009).

"Quantitative Chemical Analysis", **D.C. Harris**, Freeman, 9th ed. (2016).

"Hands-on Introduction to LabVIEW™ for Scientists and Engineers", **J. Essick**, Oxford University Press (2016).

"Communicating Science: An Introductory Guide", **R. Jensen**, RoguePublishing.ca (2016).

3. LIST OF LABORATORY EXPERIMENTS:

Expt. 1: Determination of alcohols in a bourbon sample by gas chromatography with flame ionization detection

Expt. 2: Spectrophotometric analysis of caffeine in a soft drink

Expt. 3: Analysis of food additives in a caffeinated soft drink by reversed-phase high-performance liquid chromatography and diode array detection

Expt. 4: Analysis of drugs of abuse by gas chromatography with mass spectrometric detection

Expt. 5: Quantification of major anions in a water sample by ion chromatography with indirect UV detection

Expt. 6: Analysis of trace metals in a wine sample by graphite furnace atomic absorption spectroscopy

Expt. 7: Analysis of trace metals in drinking water and wine by Inductively Coupled Plasma-Mass Spectrometry

Expt. 8: Data acquisition with National Instruments LABVIEW™ and Analog Discovery 2

4. TOPICS COVERED AND SUGGESTED READING:

	Granger (2019 ed.)	Skoog (6 th ed.)	Skoog (7 th ed.)	Moore (4 th ed.)	Harris (9 th ed.)	Essick (3 rd ed.)
Generalized Instrumentation, Figures of Merit	Ch. 1.2	Ch. 1	Ch. 1	-	Ch. 1-5	-
Evaluation of Analytical Data (Review) and Statistics of Linear Regression and Calibration Curves	Ch. 22	Ch. 1 Appendix 1	Ch. 1 Appendix 1	-	Ch. 1-5	-
Electrical Circuit Components and Circuits	Ch. 4.1-4.4, 4.6	Ch. 2	Ch. 2	Ch. 6.1-6.3	-	-
Operational Amplifiers in Chemical Instrumentation	Ch. 4.5	Ch. 3ABCE	Ch. 3	Ch. 6.4	-	-
Digital electronics, Concepts in digital Measurements	Ch 4.7	Ch. 4ABC	Ch. 4	Ch. 6.6	-	-
Introduction to data acquisition and instrument control	-	-	-	Ch. 6.7	-	Ch. 5, 12-13
Introduction to Labview™	-	-	-	-	-	Ch. 1-3, 6-8
Introduction to Microsoft Excel®	-	-	-	-	pp. xii-xiii	-
Signals and noise	Ch. 5	Ch. 5	Ch. 5	Ch. 6.8	Ch. 3; 20-6	-
Spectroscopy - components of optical instruments (sources, wavelength selection)	Ch. 3	Ch. 6 (review) Ch. 7ABC	Ch. 6-7	Ch. 4.1-4.3, 4.5-4.8	Ch. 18	-
UV, visible, and near infrared spectroscopy	Ch. 1.2, 6	Ch. 13	Ch. 13-14	Ch. 4.7	Ch. 19-20	-
Atomic Absorption and Emission Spectroscopy	Ch. 7, 9	Ch. 9, 10A	Ch. 9-10	-	Ch. 21	-
Fourier Transform (FT) Instruments and FTIR spectrometers	Ch. 11	Ch. 7I, 16 BI	Ch. 7, 17	Ch. 4.7.6	Ch. 20-5	Ch. 11
Mass spectrometry	Ch. 13	Ch. 11ABC; 20	Ch. 11ABC; 20	Ch. 5.4, 5.5	Ch. 22	-
Separations	Ch. 15.1, 15.2	Ch. 26	Ch. 26	-	Ch. 23	-
GC	Ch. 16	Ch. 27	Ch. 27	-	Ch. 24	-
HPLC	Ch. 15.3-15.5	Ch. 28A-G	Ch. 28	-	Ch. 25	-