UNIVERSITY OF CALGARY
DEPARTMENT OF CHEMISTRY
COURSE SYLLABUS
FALL 2021

1. COURSE: CHEMISTRY 515 – Advanced Instrumental Analysis

LEC	DAYS	TIME	ROOM	INSTRUCTOR	OFFICE	PHONE	EMAIL	OFFICE HOURS
L01	MWF	09:00-09:50	n/a	Dr. Osthoff	SB 205	220-8689	hosthoff@ucalgary.ca	via Microsoft Teams or Zoom by appointment

Course website or Desire2Learn (D2L) course name: https://d2l.ucalgary.ca/d2l/home/401286

2. REQUIRED TEXTBOOK:

"Instrumental Analysis", **R.M. Granger** et al., 1st revised edition, Oxford University Press (2017), ISBN: 978-0190865337. A custom print edition will be available for purchase. Custom prints from previous years may be used.

RECOMMENDED TEXTBOOKS:

"Principles of Instrument Analysis", **D.A. Skoog** et al., Brooks Cole, 6th ed. (2006); Cengage 7th ed. (2018), ISBN 978-0495012016.

"Building Scientific Apparatus", **J.H. Moore** et al., Cambridge University Press, 4th ed. (2009), ISBN 978-0521878586.

"Quantitative Chemical Analysis", **D.C. Harris**, Freeman, 9th ed. (2016), ISBN 978-1464135385

"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 drinking water and wine by Inductively Coupled Plasma-Mass Spectrometry

Department Approval: Approved by Department Head Date:

4. TOPICS COVERED AND SUGGESTED READING:

	Granger (1st ed.)	**Skoog (6th ed.)**	**Skoog (7th ed.)**	**Moore (4th ed.)**	**Harris (9th ed.)**
Generalized Instrumentation, Figures of Merit; Statistics	Ch. 1.1-1.2	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, 6.9	-
Operational Amplifiers in Chemical Instrumentation	Ch. 4.5	Ch. 3ABCE	Ch. 3	Ch. 6.4	-
Digital electronics, Concepts in digital Measurements	Ch 4.7, 5.2-5.4	Ch. 4ABC	Ch. 4	Ch. 6.6	-
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
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
Electroanalytical chemistry	Ch. 18.1-18.2; 19.1-19.4			-	Ch. 14-15, 17