

Environmental Analysis Methods

ENSC 371
Spring 2005

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Course details:

Time: Monday – Friday, 9:00-12:00 (Lab. 1:00-5:00)
Location: Lectures: TBA, Labs: ASU - BioSciences

Text:

Quantitative Chemical Analysis, 6th Ed. or 5th Ed., Daniel C. Harris, Freeman & Company

Other texts in Library

Skoog, Douglas A., *Principles of Instrumental Analysis*, 4th ed. (QD79 .I5 S58 1992t)

Keith, Lawrence H., *Environmental Sampling and Analysis :
a practical guide.* (TD193 .K45 1991t)

Barcelo, D., *Environmental Analysis :
techniques, applications, and ...* (TD193 .E54 1993)

Manahan, Stanley E., *Environmental Chemistry*, 6th ed. (QD31 .2 .M35 1994)

Marking Scheme:

Lab Hand-In Reports 30%, Problem Sets 10%, Class presentation 15%,
Midterm 15%, Final Exam 30%
(Exams will be closed-book, but equations will be provided)

Dean's Note:

Students who feel that there are reasons to review their grades should follow the steps set out in Regulation 13 'Review and Appeal of Grades.'

Course Time-table: ENSC 371		
Week 1		
(note: First class is Monday, May 2, 2005)		
Class	Topics	Text pages
Mon. 9:00	Introduction to course and overview; Sampling; sampling modes, assessment	1-9
Mon. 10:00	Quality Control – blanks, duplicates and controls; fundamentals of sample preparation for analysis; calibration, surrogated, recovery; standard reference materials.	80-92 720-740
Mon. 11:00	CAEAL, quality systems and certification, validation, calculation of uncertainty; overview of labs, lab safety tour	
Tues. 9:00	t-test, paired t-test and Q-test using environmental approaches, comparison of data from different sources; detection limits,	69-76
Tues. 10:00	Extraction methods: overview, metals by acid digestion (perchloric acid, nitric acid, etc.), microwave extraction; sample types.	705-710
Tues. 11:00	Case study for analysis of metals Extraction exercise.	
Wed. 9:00	Organics from solid – Soxhlet, accelerated solvent, sonication, microwave, supercritical fluid extractions, plant samples, GPC columns	549-550 712-714
Wed. 10:00	Extraction of non-volatile organics: from water – liquid/liquid extraction, solid-phase extraction	
Wed. 11:00	Determine capacity factor and break-through volumes from water:methanol retention data. Concentration factors.	
Thur. 9:00	Review of contaminants including pesticides, PCBs, Cl-dioxins, PAHs. Overview of chromatography: Basic principles; mobile and stationary phases and partitioning; theoretical plates, resolution and capacity factors.	548-573
Thur. 10:00	Gas Chromatography: Basic principles; capillary columns; flame ionization, electron capture, nitrogen-phosphorus, and flame photometric detectors; mass spectrometric detectors; methods and examples.	579-596
Thur. 11:00	Mass spectrometric detectors; methods and examples. Exercise with surrogate recovery calculations	518-537
Fri. 9:00	Volatile organics - purge and trap, cryogenic traps, liquid impingers and solid phase adsorbents; injectors; desorption steps and on-line coupling; solid phase microextraction (SPME).	
Fri. 10:00	Liquid Chromatography: Additional chromatographic principles; overview of HPLC columns HPLC detectors; injectors; methods and examples;	651-652
Fri. 11:00	HPLC continued	

Course Time-table: ENSC 371		
Week 2		
(note: Week 2 begins Monday, May 9, 2004)		
Class	Topics	Text pages
Mon. 9:00	Midterm (~1 hr)	
Mon. 10:30	Other matrices; air analyses; air sampling exercise	607-636
Tues. 9:00	Spectroscopic methods: overview of absorbance, emission; instrumentation; analytes in solution; elemental analysis; elements of interest; speciation.	494-514
Tues. 10:00	Analysis of metals/heavy elements: flame, furnace and ICP instruments; other atomizers; mass spectrometric detectors; internal standards and calibration; XRF; μ NAA.	
Tues. 11:00	Exercise in ICP analysis	
Wed. 9:00	Inorganics; ion chromatography; electrodes: selective electrodes	647-650 330-336
Wed. 10:00	Student presentations (teams 1 and 2 - 30 min/team)	
Wed. 11:00	Student presentations (teams 3 and 4 - 30 min/team)	
Thur. 9:00	Mass spectroscopy continued	481-488 442-443
Thur. 10:00	Other Analysis Methods: Parameters including autoanalyzers, FTIR, leachate, BOD, nitrates, etc	444-445
Thur. 11:00	In-field and screening analysis: test kits, Hach kits, immunoassays.	
Fri. 9:00	Case study: Resolution Island	
Fri. 10:00	Case study: contaminants in drinking water; LC/MS; Emerging environmental contaminants – persistent pharmaceuticals, perfluorinated compounds	
Fri. 11:00	Extra... More contaminants: non-volatile organics – surfactants, estrogens; inorganic ions –, halides.	

Fri. 1:00 p.m.	Final Exam (~ 3 hrs)	
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