

THE COLLEGE OF THE BAHAMAS



COURSE PROPOSAL FORM

COURSE ABBREVIATION & NUMBER

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SCHOOL: NATURAL SCIENCES & ENVIRONMENTAL STUDIESDEPARTMENT: CHEMISTRYCOURSE TITLE: MODERN METHODS OF DETERMINING THE STRUCTURE OF ORGANIC COMPOUNDS

COURSE DESCRIPTION FOR CATALOGUE (50 WORDS MAXIMUM):

This course introduces students to the process of interpretation of spectra produced by modern analytical instruments. Forensic, medical, pharmaceutical and other industrial applications are explored.

PURPOSE OF COURSE:

University Transfer	(X)	External Examination	()
College Diploma or Certificate	()	Recreational/General	
College Degree	(X)	Interest (non-credit)	()
Upgrading	()	Professional Development	(X)

PRE-REQUISITE(S): CHEM 230 or permission of the Chairperson/Instructor

CO-REQUISITE(S): NONE

HOURS PER WEEK: Lecture 3 Laboratory 0 Seminar _____ Tutorial ____

LAB/TUTORIAL FEES: NONE

SEMESTER HOUR CREDITS: 3

SEQUENTIAL COURSE(S): NONE

OTHER COB COURSES HAVING CONTENT OVERLAP: CHLB 330

COURSE DEVELOPED (X) /REVISED () BY:

(1) Dr. Danny Davis	Date: January 10, 2003
(2)	Date:

APPROVALS:	Chair of School: _____	Date: _____
	Head of Department: _____	Date: _____
	Dean: _____	Date: _____
	Academic Board: _____	Date: _____

NOTE:

1. A detailed course description must be attached. This must include course objectives, list of topics covered, prescribed textbooks, reading list, method of assessment, and external examinations which are prepared for in this course.
2. The course description must be suitable for distribution to students.
3. Only lecturers/instructors approved by The College will be allowed to teach this course.

**THE COLLEGE OF THE BAHAMAS
SCHOOL OF NATURAL SCIENCES AND ENVIRONMENTAL STUDIES
DEPARTMENT OF CHEMISTRY**

CHEM 331 – Modern Methods of Determining the Structure of Organic Compounds

3 semester hour credits

Course Description

This course introduces students to the process of interpretation of spectra produced by modern analytical instruments. Forensic, medical, pharmaceutical and other industrial applications are explored.

Specific Objectives

Upon successful completion of this course, students will be able to

1. analyse and interpret infrared, ultraviolet, nuclear magnetic resonance and mass spectra;
2. interpret multiple kinds of spectra to elucidate the structure of unknown compounds;
3. evaluate the suitability of various techniques for the elucidation of organic structures; and
4. design appropriate methodology for the confirmation of organic structures.

Course Content

- A. Molecular Formula
 1. Elemental analysis
 2. Calculation of empirical formula
 3. Calculation of percent composition from combustion data
 4. Use and calculation of the index of hydrogen deficiency
- B. Infrared (ir) Spectroscopy
 1. Types of energy and their resulting molecular transitions
 2. Modes of vibration and bending
 3. Bond properties and absorption trends
 4. Use of ir correlation charts to determine the presence of the major functional groups
- C. Ultraviolet (uv) Spectroscopy
 1. Electronic excitations
 2. Origins of uv band structure
 3. Beer's Law and its application to purity calculations
 4. Choosing solvents
 5. Auxochromes and substituent effects
 6. Effect of conjugation
 7. Visible spectra
 8. Use of uv spectra to determine chemical structure
- D. Mass Spectroscopy (ms)
 1. General overview of the mass spectrometer
 2. Features of a mass spectrum
 - a. resolution
 - b. isotopes
 - c. relative abundance of M, M+1 and M+2 peaks
 3. Use of ms to determine chemical structure
- E. Nuclear Magnetic Resonance (nmr)
 1. Nuclear spin states and magnetic resonance
 2. The continuous wave (cw) and Fourier Transform (FT) nmr spectrometer
 3. Equivalent hydrogens, chemical environment and chemical shift
 4. Measurement of spectra
 5. Interpretation of ^1H and ^{13}C nmr spectra

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Assessment

Homework assignments	15%
Class tests	15%
Mid-semester test	15%
Project/case study	15%
<u>Final exam</u>	<u>40%</u>
Total	100%

The mid-semester test and the final exam will consist of two parts, (i) a closed book section, followed by (ii) an open book section.

Required Text

Webster, F. X., & Silverstein, R. M. (2003). *Spectrometric identification of organic compounds* (7th ed.). New York: John Wiley & Sons. ISBN 0-471-13457-0

Supplementary Readings

Brown, W.H., & Foote, C.S. (2002). *Organic chemistry* (3rd ed.). New York: Harcourt College Publishers. ISBN 0-03-033497-7

Bruice, P.Y. (2001). *Organic chemistry* (3rd ed.). New Jersey: Prentice Hall, Inc. ISBN 0-13-017858-6

Pavia, D.L., Lampman, G.M., & Kriz, G. S. Jr. (1979). *Introduction to spectroscopy*. New York: Saunders College Publishing. ISBN 0-7216-7119-5

Williams, D. H., & Fleming, I. (1998). *Spectroscopic methods in organic chemistry* (4th ed.). New York: McGraw Hill Book Company. ISBN 0-07-707212-X