# Courses Allen D. Hunter has Taught: 1987-2000

(June 9th, 2000)

## At Youngstown State University (1992-2000)

Chemistry 500, Chemistry in Modern Living: A one quarter course for non-science students emphasizing the scientific method, the way chemists approach problems, and the application of fundamental chemical principles to understanding the world around us. The emphasis is on collaborative highly interactive learning styles. Text: "Chemistry in Context" from the American Chemical Society.

Chemistry 505&506, Allied Health Chemistry 1&2: I have taught the lecture component of this course which is designed to meet the needs of allied health students. This two quarter course covers general chemistry in the first quarter and organic chemistry and basic biochemistry in the second quarter (both relevant to majors such as Food and Nutrition and Nursing). Text for 1999-2000: Bettelheim and March, "General, Organic & Biochemistry."

Chemistry 719, 720, 721, Organic Chemistry 1, 2, 3: A one year lecture and laboratory sequence at the sophomore/junior level in organic chemistry. Text for 1992-94: Morrison and Boyd, "Organic Chemistry." Text for 1994-2000: Fox and Whitesell, "Organic Chemistry."

Chemistry 785, Biochemistry 1: A one quarter lecture course at the junior level in structural biochemistry. Text: Stryer, "Biochemistry."

Proposed: Chemistry 805, Applied Spectroscopy: This lecture course is for senior undergraduates and graduate students and is devoted to teaching students how one interprets spectroscopic data to derive the structure of unknown organic and inorganic molecules. The emphasis is on learning by solving real world examples including those drawn from texts, faculty research, the literature, and on-line data bases. Texts: Handouts provided in class, software provided in the computer lab. Was not offered in 1997 due to low enrollment, will be offered in future years.

Chemistry 822, Organic Analysis Lab, and 994, Special Topics in Organic Chemistry, Applied NMR Spectroscopy: One quarter lecture/lab courses for senior undergraduates and graduate students, respectively, devoted to advanced methods for the characterization of organic compounds. The emphasis is on understanding, through the integration of theory and "hands on" practice, how to use advanced instrumental methods. Because of our recent purchases of an advanced 400 MHz NMR spectrometer, X-ray Diffractometers, and a GC/MS system, this class will focus on these techniques, but other methods such as IR and UV-Visible spectroscopy will also be covered. Practical aspects of setting up and optimizing instrumental methods for the determination of the structures of complex organic molecules are taught. Texts for 1995: Sanders and Hunter, "Modern NMR Spectroscopy;" Varian, "Gemini-2000 Manual Set." Text for 1996: Silverstein, Bassler, and Morril, "Spectroscopic Identification of Organic Compounds."

Chemistry 823, Advanced Organic Synthesis Lab: A one quarter lab course for senior undergraduates and graduate students concentrating on "research type" organic synthesis problems. Laboratory studies include extensive literature searches, syntheses, purification methods, identifications, and the preparation of a final report(s) in the format of a paper to be submitted to an American Chemical Society Journal such as the *Journal of Organic Chemistry*. Text: readings from the journal *Organic Syntheses*.

Chemistry 824, Introduction to Polymer Chemistry: A one quarter lecture course for senior undergraduates and graduate students concentrating on the synthesis and characterization of organic polymers and especially on the understanding and prediction of structure-property relationships by the extension of concepts learned for small molecules in organic chemistry classes. Text: Stevens, "Polymer Chemistry."

Chemistry 825, Polymer Laboratory: A one quarter lab course for senior undergraduates and graduate students concentrating on the fundamentals of polymer synthesis and characterization. Laboratory studies include literature searches, syntheses, identifications, molecular weight determinations, materials properties and additive studies, and the preparation of a final report(s) in the format of a paper to be submitted to an American Chemical Society Journal such as *Macromolecules*. Texts: EMMSE, "Laboratory Experiments in Polymer Synthesis and Characterization;" Campbell and White, "Polymer Characterization;" Crompton, "Analysis of Polymers: An Introduction;" Stevens, "Polymer Chemistry;" Varian, "Gemini-2000 Manual Set;" and readings from *Macromolecules, Organometallics*, and the *Journal of Polymer Science: Part A: Polymer Chemistry*.

Chemistry 830, Inorganic Chemistry III. This one quarter class focuses on the inorganic chemistry of the transition elements. My contribution to this class involves guest lecturing for three to four lectures on the chemistry of transition metal organometallic compounds with and emphasis on the relationship between their bonding and their structural, spectroscopic, and electrochemical properties.

Chemistry 831, Inorganic Chemistry Laboratory: A one quarter lab course for senior undergraduates and graduate students concentrating on the fundamentals of the synthesis and characterization of representative main-group and transition metal coordination and organometallic compounds. Laboratory studies include extensive literature searches, syntheses, purification methods, identifications, and the preparation of a final report(s) in the format of a paper to be submitted to an American Chemical Society Journal such as *Organometallics* or *Inorganic Chemistry*. The emphasis is on structure-property relationships on "research like" problems. Texts: Varian, "Gemini-2000 Manual Set;" and readings from *Organometallics*, *Inorganic Chemistry*, the *Journal of Organometallic Chemistry*, and *Inorganic Syntheses*.

Chemistry 832, Solid State Structural Methods and Chemistry 993, Special Topics in Inorganic Chemistry, Solid State Structural Methods: The recent acquisition of our two new X-ray diffractometers and the bringing of our transmission electron microscope "on line", by Dr. Wagner, now gives us the ability to teach a "hands on" course in which students will use "state of the art" technologies to determine the structures of new materials in the solid state including information on molecular structures, intermolecular interactions, and periodic arrangements and structural defects. This class will

include a combination of formal lectures, instrument and software demonstrations, and "hands on" experiments. To familiarize them with the software, the application of the theory they have learned, and the "tricks of the trade", each student will solve a series of X-ray crystal structures using raw data that has been previously collected by YSU faculty, other students, or obtained from collaborating institutions. They will also collect at least one complete data set themselves for a new compound that has never had its crystal structure determined previously. They will then solve this structure(s), write it up in the form of a crystal structure report paper, present their results to the class, and submit their paper to the highly respected and peer reviewed journal, *Acta. Cryst.* Texts: Glusker, Lewis, and Rossi, "Crystal Structure Analysis for Chemists and Biologists" and X-Ray Structure Determination via SHELXTL: A Beginners Introductions" by A. D. Hunter.

Chemistry 850, Undergraduate Research and Chemical Engineering 801, Undergraduate Research: For these courses, I have supervised undergraduate research project for Chemistry and Chemical Engineering students.

Chemistry 993, Special Topics in Inorganic Chemistry, Transition Metal Organometallic Chemistry: A one quarter course for graduate students on the organometallic chemistry of the transition elements. The emphasis is on the relationships between structures, spectroscopic properties, bonding, and reactivaties of these materials by the extension of concepts familiar from previous organic and inorganic classes. Students are expected to be able to rationalize experimental results and make predictions in these areas and by the end of the course to understand current literature papers. Texts: Lukehart, "Transition Metal Organometallic Chemistry;" and readings from the *Journal of the American Chemical Society, Organometallics*, *Inorganic Chemistry*, and the *Journal of Organometallic Chemistry*.

Chemistry 993. Special Topics in Inorganic Chemistry, Advanced Single Crystal Diffraction Analysis: is an intensive laboratory course design for those wanting an in depth exposure to the application of X-ray diffraction analysis to the determination of new structures. This 3 QH class will meet for one hour each week to discuss advanced aspects of solid state structure determination and for an average of six hours each week in the lab (times to be arranged to fit participants' and diffractometer schedules) to carry out new diffraction analyses. The students will completely characterize several compounds by X-ray crystallography. Specific stages of the crystallographic process to be included are: growing single crystals; selecting, mounting, and evaluating crystals; collecting complete diffraction data sets; processing the collected data; calculating the new crystal structures; data base searching; and preparing structure reports for publication. Specific crystals to be studied will be supplied by the student, internal and external collaborators, or by the instructor. Prerequisite: Chemistry 832/993, Solid State Structural Methods.

Chemistry 997, Special Topics in Polymer Chemistry, High Performance Polymers: A one quarter course for graduate students on the synthesis, characterization, and utilization of high performance polymers (defined as components of "non-commodity" and "high value added" engineering plastics and resins). Examples to be studied include "inorganic" polymers such as polysilanes, polysiloxanes, polyphosphazenes, and organometallic polymers which will be compared to engineering grades of more conventional "organic" polymers such as vinyl polymers, polyethers, polysulfides, polysulfones,

polyarylenes, polyacetylenes, polypyrroles, polyesters, polyamides, polyarylamides and of. Texts: Stevens, "Polymer Chemistry;" Mark, Allcock, and West, "Inorganic Polymers;' and readings from *Macromolecules, Organometallics, Inorganic Chemistry, Polymer Preprints,* the *Journal of Polymer Science: Part A: Polymer Chemistry* and compilations of polymer chemistry review articles in journals, books, conference proceedings, and polymer encyclopedia.

Chemistry 997, Special Topics in Polymer Chemistry, Non-Linear Optical Polymers: A one quarter intensive lab course for graduate credit on the synthesis, characterization, and utilization of non-linear optical polymers. This 3 QH class will meet for one hour of discussion each week on theoretical and applied aspects of NLO polymers and will have six hours of lab each week. Students will synthesize and characterize several new NLO polymers, especially acrylamide and acrylate polymers having NLO side chains and NLO doped acrylamide and acrylate polymers. Readings from the current literature and polymer/materials monographs. Final report on results will be required.

Chemistry 850 and 990, BS and MS Research Classes: Research in organometallic chemistry, supramolecular host/guest chemistry, polymer chemistry, NMR spectroscopy, X-ray diffraction analysis, the application of advanced instrumental methods to curricula, and the application of new NMR methods to breast cancer diagnosis and treatment.

## Courses Optimized for Pre-College Teachers:

Chemistry 969, Laboratory Problems - 1996: In this lab class, the student, a high school science teacher, developed a curriculum module on spectroscopic methods for use in pre-college chemistry classes and which will also be useful for some 700 and 800 level chemistry classes.

Chemistry 969, Laboratory Problems - 2000: In this lab class, the 6 students, all high school science teachers, are developing a set of curriculum modules on crystallography and diffraction methods for use in pre-college and college chemistry classes. This is part of a National Science Foundation Educational Materials Development grant project.

Chemistry 991/994, Applied Spectroscopy and Organic Analysis for Pre-College Science Teachers: These two classes were taught as special sections of Chemistry 805 and 822 optimized to meet the professional development needs of pre-college science teachers. Thus, the content was somewhat more focused (avoiding the more esoteric spectroscopic methods but giving more information on the most relevant methods) and the relationship of each topic to the pre-college curriculum was discussed in detail.

Proposed: Chemistry 997, Plastics, Polymers, and Materials: From Consumers to the Classroom: This is a new lecture class *proposed* for the summer of 1997 to help meet the professional development needs of high school science and chemistry teachers. The course is based on Chemistry 824 and optimized for the background and interests of teachers with a somewhat narrower and more applied focus than when taught for chemistry majors. The emphasis is on understanding aspects of plastics,

polymer, and materials chemistry that one encounters in everyday life. Applications of this material to the pre-college curriculum will be discussed in detail. Was not offered in 1997 due to low enrollment, will be offered in future years.

Proposed: Secondary Education 991o, Seminar in Secondary Education (Summer of Growth), Its a Plastic World: From Consumers to the Classroom: This is a new lecture class *proposed* for the summer of 1997 Summer of Growth to help meet the professional development needs of elementary and middle school teachers. The course is designed to give these teachers the background knowledge required to understand plastics and related natural materials. The emphasis is on understanding plastics and related natural materials that one encounters in everyday life. Applications of these ideas to elementary and middle school will be discussed in detail and numerous ideas for demonstrations and experiments will be presented. Was not offered in 1997 due to low enrollment, will be offered in future years.

## At the University of Alberta (1987-92)

Chemistry 330, Inorganic Chemistry: A full year lecture and laboratory course for junior chemistry students on main-group and transition metal inorganic chemistry. The focus of this course is on the relationships between structure, bonding, properties, and reactivity with particular emphasis on periodic trends in these characteristics. Texts for Lecture: Cotton, Wilkinson and Gaus, "Basic Inorganic Chemistry;" and selected readings from journals. Text for Laboratory: Allen Hunter, "Chemistry 330 Laboratory Manual."

Chemistry 437, Organometallic Chemistry: A one semester course for senior undergraduates and graduate students on the organometallic chemistry of the transition elements. The emphasis is on the relationships between structures, spectroscopic properties, bonding, and reactivities of these materials by the extension of learned in the student's one year long junior level Inorganic class. Students are expected to be able to rationalize experimental results and make predictions in these areas and by the end of the course to understand current literature papers. Texts: Lukehart, "Transition Metal Organometallic Chemistry;" and readings from the *Journal of the American Chemical Society*, *Organometallics*, *Inorganic Chemistry*, and the *Journal of Organometallic Chemistry*.

Chemistry 6xx, Structural Methods in Inorganic Chemistry: I team taught parts of this upper level graduate course which emphasized the principles and practical aspects of the various techniques used to determine the structures of inorganic compounds. Text: Ebsworth, Rankin, and Cradock, "Structural Methods in Inorganic Chemistry."

B.Sc., M.Sc., and Ph.D. Thesis Advisor on Projects in the areas of: organometallic chemistry, organometallic electrochemistry, organometallics in organic synthesis, and polymer chemistry.