01/11, 16 Introduction, chemistry overview, DNA structure, lectures #1,2
01/18 Thermodynamics, lectures #3
01/23, 25 DNA replication, lectures #4,5
01/30, 02/01 Transcriptional process, lectures #6,7
02/06 Transcription/translation, lecture #8
02/08 Transcriptional control, lecture #9
02/13 Repair (non-enzymatic), lecture #10
02/15, 20 Repair (enzymatic), lectures #11,12
02/22, 27 Signal transduction; Ras oncoproteins, lectures #13,14
03/01, 06 Cell cycle regulation, lectures #15,16
03/08 Apoptosis, lecture #17
03/20, 22 Oncogenes/tumor suppressors lectures #18,19 (Spring break Mar. 08 – 20)
03/27, 29 Epigenetics, role of DNA adducts in cell reprogramming lectures #20,21
04/03 Role of DNA adducts in methylation status, miRNA, histone remodeling #22
04/05, 10 Role of activated oncogenes cellular reprogramming, lectures #23,24
04/12, 17 Xenobiotic activation, P450 polymorphisms lectures #25,26
04/19 DNA adducts structure lecture #28
04/24, 26 Oxidative stress, take home final lectures #29, 30

This course is intended for students with a basic foundation in organic chemistry, who wish to gain familiarity with both the chemical and molecular biological aspects of chemical carcinogenesis. The course is intended to integrate elements of chemistry and molecular biology into a framework that makes clear where current research is heading. *Topics are updated according to the current literature and provide a broad exposure to contemporary issues in environmental sciences and environmental health, specifically the role of chemicals in carcinogenesis. The course aims to analyze, interpret and explain the results of original research in the areas treated in the syllabus. Overall, the course will contribute towards the basic public health concept of how exposures to carcinogenic chemicals impact on human health.*

There is no example of a continuous thread of explanation leading from an initial chemical lesion to cell transformation. However, with the help of structural determinations of DNA·polymerase

complexes and DNA repair protein complexes by NMR spectroscopy and x-ray crystallography, the mechanisms by which mutations result from processing of lesions will be described. This is an area where significant progress will be achieved in the near future. Chemically induced mutations may alter genes and non-translated DNA sequences involved in DNA processing. Mutated genes relevant to malignant transformation of cells designated "oncogenes", and the gene products have been identified. The function of the transforming proteins and their probable roles in cell transformation will be discussed. Many oncogene products are related to their normal analogs by changes in relatively few amino acids, the building blocks of proteins. Since there is a rigorous correlation between molecular structure and function of proteins, the relationship between chemical make-up and molecular structure will be an area of focus.

Within the past five years, a role in cellular reprogramming has been recognized for oncogenes activated by chemical mutation, and this new development will be described.

Metabolic transformation is required to activate a large proportion of carcinogenic chemicals, and the enzymes and processes involved will also be described.