FOOD CHEMISTRY
400:411 (4 Credits)
COURSE OUTLINE

Faculty:
Dr. George M. Carman
Food Science Building, Rm 203E
Phone: 932-9611 (ext 217)
Email: carman@aesop.rutgers.edu
Http://foodsci.rutgers.edu/carman/index.html

Course Description:
The course applies basic scientific principles to food systems and practical applications. Chemical/biochemical reactions of carbohydrates, lipids, proteins, and other constituents in fresh and processed foods are discussed with respect to food quality. Reaction conditions and processes that affect color, flavor, texture, nutrition, and safety of food are emphasized. Students are given a role in the learning experience through group discussions and independent projects related to real world problems associated with the food industry. Students take an active role in learning course content (presented via Power Point presentations), which is available to class participants on the Food Chemistry web site. Student groups are given experiments that reinforce class discussions that are conveniently performed in the laboratory. These include activation and control of enzymatic reactions in fruits and vegetables; consequences of water migration on food quality; gelatinization-retrogradation in starch-based foods (e.g., pudding, bread, and rice); initiation and control of non-enzymatic browning (e.g., pretzels, meat); and food emulsions (e.g., salad dressings, commutated meats products).

Learning Outcomes:
Students are expected to understand and be able to control the major chemical and biochemical (enzymatic) reactions that influence food quality with emphasis on food industry applications. To understand how the properties of different food components and interactions among these components modulate the specific quality attributes of food systems, and to understand the principles that underlies the biochemical/enzymatic techniques used in food analysis.

Learning Assessments:
Course content is assessed through three written examinations and class participation with an emphasis on problem solving related to real life situations that one may encounter in the food industry. Group projects are assessed through professionally prepared oral presentations and written reports. Teamwork is critical to the project and grading. Grades from the exams will count for 75% of the final grade. Group project and laboratory reports will count for 25% of the final grade. Class participation will be factored into the final grade.

Prerequisites:
Principles of Food Science, Organic Chemistry, and General Microbiology

Reference book and readings:
Fennema’s Food Chemistry, fourth edition, edited by S. Damodaran, K.L. Parkin, and O. R. Fennema, 2007, published by CRC Press may be used as a reference. Students are responsible for reading articles that are found in the library and on the Internet

Food Chemistry (course outline)
Lecture/Laboratory Outline:

**Topic**

- Cellular basis of foods (animal, plant, and microbial sources)
- Water activity and water migration; the basis for food preservation (concepts emphasized in a laboratory experiment)
- The roles of enzymes in food production, processing, and quality attributes (concepts emphasized in a laboratory experiment)
- Fruits and vegetables; ripening and storage quality (concepts emphasized in a laboratory experiment)
- Meats; biological and chemical considerations (concepts emphasized in a laboratory experiment)
- The roles of carbohydrates in food structure, color, flavor, and texture (concepts emphasized in a laboratory experiment)
- The roles of lipids in food structure, color, flavor, and texture (concepts emphasized in a laboratory experiment)
- The roles of proteins in food structure, color, flavor, and texture (concepts emphasized in a laboratory experiment)
- Enzymatic and non-enzymatic browning reactions; influences on color, flavor, and texture (concepts emphasized in a laboratory experiment)
- Food additives and product labeling

**Product Development Project:**

The class will be divided into groups of 3 to 4 students. Each group will be responsible for the development of a novel food. The novel food should be developed and characterized with an emphasis on the principles of food chemistry. Each group will be responsible for an oral presentation and for a typed written report. The oral and written reports should consist of the elements below. The oral report should be presented in a professional manner using computer projections. The written report should be typed. Each student in the group will receive a grade commensurate with their contribution to the group as a whole. Teamwork (i.e., cooperation) is critical to the project and grading. Group presentations will be made during the last week of the semester. The written report is due on the last day of class.

*Elements of the Oral and Written Reports:*

Introduction of the novel food, the components and processing of the food, biochemical, chemical, and physical interactions of food components, packaging and shelf life of the food, discussion, and citations throughout the text and references listed at the end (use the format of the *Journal of Food Science*).