ity and mechanism of action illustrated by use of selected enzymes. (Former course Biochemistry and Biophysics 122L.) GE credit: SciEng | QL, SE, VL — S. (S.) G. Smith

123L. Enzymology Laboratory (2) Lecture—1 hour; laboratory—3 hours. Prerequisite: Biological Sciences 103, course 123 (concurrently). Laboratory—1 hour; laboratory—3 hours. Principles of protein function in biological processes. GE credit: SciEng | QL, SE, VL, WE — S. (S.) G. Smith

127. Sensory Evaluation of Foods (4) Lecture—3 hours; laboratory—3 hours. Prerequisite: course 117. A critical examination of methods of sensory measurement applied to food and beverage systems; descriptive analysis and consumer tests and their application to quality assurance, product development and optimization. GE credit: SciEng | QL, SE, WE — W. (W.) Guinard

128. Food Toxicology (3) Lecture—3 hours. Prerequisite: Biological Sciences 102, 103. Chemistry and biochemistry of toxins occurring in foods, including plant and animal toxins, intentional and unintentional food additives. The assessment of food safety and toxic hazards. (Same course as Environmental Toxicology 128.) GE credit: SciEng | SE — S. (S.) Oaikwad

131. Food Packaging (4) Lecture—3 hours; discussion—1 hour. Prerequisites: Chemistry 88, Biological Sciences 1IB, Physics 7C. Case studies of materials and packages, emphasis on biodegradable materials; food and beverage packaging in a global context. GE credit: SciEng | QL

151Y. Food Freezing (1) Discussion—1 hour; web virtual lecture. Prerequisite: course 110A or the equivalent. Mechanisms of ice recrystallization, freezing of fluids, and modes of heat transfer. Food properties at sub-freezing temperatures, refrigeration requirements, and estimation of freezing times. Industrial systems used in freezing foods. GE credit: SciEng | QL, SE

159. New Food Product Ideas (3) Lecture—3 hours. Prerequisite: course 50D; Biological Sciences 2A, 2B, 2C, Physics 7A, 7B, 7C, and Chemistry 2A, 2B, 2C. Create, refine, test and present viable ideas for new food products. Activities include trend monitoring, consumer research, idea generation, developing a market and new product concept presentations. GE credit: ArtHum or SocSci | AH or SS, QL, OL, WE — F. (F.) Biltokoff

160. Food Product Development (4) Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisites: courses 50, 103, 104, 107. Product implementation stage of food product development including preliminary product description, prototype development, product testing, and formal presentation of a new food product development. GE credit: SciEng | QL, OL, SE, VL — S. (S.) Lange

190. Senior Seminar (1) Seminar—1 hour. Prerequisite: senior standing or consent of instructor. Selected topics presented by students on recent advances in food science and technology. Reports and discussions concerning oral and written presentations, literature sources and career opportunities. GE credit: SciEng | QL, SE — S. (S.) Young

192. Internship for Advanced Undergraduates (1-12) Internship—3-36 hours. Prerequisite: consent of instructor. Work experience on or off campus in the professional field of food science. (P/NP grading only.) GE credit: SE

198. Directed Group Study (1-5) Lecture/discussion—3 hours. Prerequisite: permission of instructor. GE credit: SciEng | QL, SE, VL, LS — S. (S.) Young

199. Special Study for Advanced Undergraduates (1-5) (P/NP grading only.) GE credit: SE.

Graduate

201. Food Chemistry and Biochemistry (4) Lecture—4 hours. Prerequisite: undergraduate courses in organic chemistry; undergraduate course in food chemistry is recommended. Restricted to graduate standing or consent of instructor. Advanced topics in food chemistry and biochemistry; application of food chemistry and biochemistry to food composition, properties, preservation and processing. GE credit: SciEng | SE — S. (S.) Oaikwad

202. Chemical and Physical Changes in Food (4) Lecture—3 hours; term paper. Prerequisite: Biological Sciences 103, 107B. Fundamental principles of chemistry and physics are applied to a study of changes in water binding properties and activity, changes in proteins, nutrients, toxic constituents, and other compounds during storage, heating, freezing, dehydrating, and concentrating of food materials. — S. (S.) Dungan

203. Food Processing (4) Lecture—3 hours; discussion—1 hour. Prerequisite: course 110A, Physics 5C or 7C, Chemistry 107B, or consent of instructor. Principles of food engineering applied to food processing. Relationship of Newtonian and non-Newtonian fluid properties to heat and momentum transfer and the transfer of mass in controlling kinetics and quality changes of foods. — W. (W.) Nitin

204. Advanced Food Microbiology (3) Lecture—3 hours. Prerequisite: Biological Sciences 1C, 103, course 104 or a course in microbiology. Principles of and recent developments in food microbiology, including food pathogen virulence and detection, parameters of microbial growth in food, and the microbiology of food and beverage fermentations. — S. (S.) Marco

205. Industrial Microbiology (3) Lecture—3 hours. Prerequisites: Biological Sciences 1A, 102, 103, Microbiology 130A-130B or Biological Sciences 101 recommended. Use of microorganisms for producing substances such as amino acids, peptides, enzymes, antibiotics and organic acids. Emphasis on metabolic regulation of pathways leading to fermentation products and other fermentation products, and on genetic manipulations (including recombinant DNA techniques) of industrial microorganisms.

207. Advanced Sensory-Instrumental Analyses (3) Lecture—2 hours; laboratory—3 hours. Prerequisite: course 107 and consent of instructor. Basic principles of measurement of color, texture, and flavor of foods by sensory and instrumental methods. Advanced applications of instrumental techniques and colorimetry, texturometry, and chemistry of volatile compounds to perception of appearance, texture, flavor.

210. Proteins: Functional Activities and Interactions (3) Lecture—3 hours. Prerequisite: Biological Sciences 103. The relationships of structure of proteins to their biological functions. Structural proteins, complexing proteins, and catalytic proteins in plant and animal materials and human nutrition.

211. Lipids: Chemistry and Nutrition (3) Lecture—3 hours. Prerequisite: Biological Sciences 103, Chemistry 107B, 128B. Chemistry of lipids as they pertain to research in food and nutrition. Relations between lipids and structural properties in tissues and foods. Regulation of absorption, transport, and metabolism of lipids. Implications of dietary fats and health. — W. (W.) German

213. Flavor Chemistry of Foods and Beverages (4) Lecture/discussion—3 hours. Prerequisite: Chemistry 88, Viticulture and Enology 123, Viticulture and Enology 123L or course 103 or consent of instruc-
tors. Students will become familiar with basic princi-
ple of flavor chemistry, analysis, and formation in fresh and processed foods. Students will be required to read and critically evaluate flavor chemistry litera-
ture. (Same course as Viticulture and Enology 213.) — S. (S.) Ebeler, Heymann

217. Advanced Food Sensory Science (3) Lecture—3 hours. Prerequisite: course 107 may be taken concurrently or consent of instructor. Advanced study of the techniques and theory of the sensory measurement of food as an analytical tool and as a measure of consumer acceptance. Advanced examination of the sensory and cognitive systems associated with the perception of food. — F. (F.) O’Mahony

219. Biochemistry, Microbiology, and Technology of Cheese of the World (4) Lecture—4 hours. Prerequisite: course 119 and Biological Sciences 103 or course 100A, 123, Biological Sciences 103, Chemistry 107B, 128B or consent of instructor. Required for graduate level students or senior undergraduate students with appropriate background in biochemistry and microbiology. Comparative and physico-chemical aspects of milk and its implications on cheesemaking; enzymatic, microbiological and physical aspects of cheesemaking; cheese as a biological composite; designing cheese quality attributes; cheese aging. Cheese from all over the world will be tasted and discussed. Offered in alternate years. — S. (S.) Rosenberg

227. Food Perception and the Chemical Senses (2) Lecture—2 hours. Prerequisite: course 107B (may be taken concurrently), or consent of instructor. Examination of the anatomy and physiology of the chemi-
ses senses (taste, smell, and the trigeminal senses) and how they are involved in the perception of food and food intake. — W. (W.) Guinard

290. Seminar (1) Seminar—1 hour. May be repeated for credit. (S/U grading only.) — F. W. S. (F. W. S.)

290C. Advanced Research Conference (1) Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Critical presentation and evaluation of original research by graduate students. Planning of research programs and proposals. Discussion led by individual major instructors for their research groups. (S/U grading only.) — F. W. S. (F. W. S.)

291. Advanced Food Science Seminar (1) Seminar—1 hour. Prerequisite: completion of at least one quarter of course 290. Oral presentation of stu-
dent’s original research findings, and critical evalu-
ation. (S/U grading only.) — S. (S.)

298. Group Study (1-5) (S/U grading only.)

299. Research (1-12) Prerequisite: graduate standing. May be repeated for credit. (S/U grading only.) — F. W. S. (F. W. S.)

Professional

396. Teaching Assistant Training Practicum (1-4) Prerequisite: graduate standing. May be repeated for credit. (S/U grading only.) — F. W. S. (F. W. S.)

Food Service Management

(College of Agricultural and Environmental Sciences)

Faculty. See under the Department of Nutrition, on page 490.

The Major Program and Graduate Study. Food Service Management is a major within the major of Clinical Nutrition. If you are interested in preparing for a career in commercial organiza-
tions such as hotels, restaurants, industrial cafeterias, or contract food services, as well as in public or pri-
vate institutions such as hospitals, correctional institu-
tions, schools, or colleges, consult the Department of Nutrition.
Forensic Science (A Graduate Group)

Robert H. Rice, Ph.D., Chair.

Graduate Study. The Forensic Science Graduate Group offers the degree of MS in Forensic Science. This program offers a Plan I Thesis option, has two tracks, DNA or Criminalistics, enabling the student to take core courses emphasizing the physical or biological sciences. Each track requires the student to take eight to nine core courses, totaling 24-27 units, three units of seminar, and the appropriate number of elective/research units for a total of 54 units. Students can take courses outside their specializations, but they must complete the courses required for their own track. The FOR seminar course in the fall quarter is required for new students. The FOR spring seminar can be taken in any spring quarter before graduation. Students must also take one additional seminar course in another department or program.

Preparation. Appropriate preparation is an undergraduate degree in physical or natural sciences, engineering or a closely related field with a GPA of 3.000 or higher. Examples include Biochemistry, Chemistry, Molecular Biology, Biology, Genetics, and Engineering. Each track requires the student to take core courses emphasizing the physical sciences, and computer applications. —W. (W.) Frank

200. Fundamental Concepts in Forensic Science (3)
Lecture—2 hours; laboratory—0.25 hours; seminar—0.5 hours. Overview of forensic science, problem definition, strategies for solving problems, analytical tools, and professional and ethical considerations. —F. (F.) Sensabaugh

205. Microscopy and Microanalytical Methods in Forensic Science (3)
Lecture—2 hours; laboratory—1.5 hours. Prerequisite: consent of instructor. Restricted to students enrolled in the M.S. in Forensic Science Program; a minimum of one year each of general chemistry, organic chemistry, calculus, and physics. Introduction to optical and electron microscopy. Transmission, diffraction, reflection and absorption; polarized light and polarizing microscopes; X-ray diffraction; image recording, SEM analysis of gunshot residues, paints, glass, EDS, XRF analysis, signal-to-noise ratios, minimum detectable levels and homogeneity. Offered in alternate years. —S. (S.) van Benthem

207. Advanced Spectroscopy Methods in Forensic Science (3)
Lecture—3 hours. Restricted to Forensic Science Graduate Program or consent of instructor. Discuss, evaluate and integrate advanced molecular spectra/structure, Infrared Spectroscopy, such as chemical applications of spectroscopic methods, vibrational, rotational spectra, electronic spectra, photobioelectronic spectroscopy generated by various analytical instruments used in forensic science community. Offered in alternate years. —F. (F.) Wood

210. Personal Identification Methods in Forensic Science (3)
Lecture—3 hours. Prerequisite: restricted to students enrolled in the M.S. Forensic Science Program or consent of instructor. Methods for identifying individuals from evidence collected at crime scenes, suspects or victims, using comparison and analytical methods used to support such investigations. Topics include forensic anthropology and odontology; latent prints; shoe prints; facial reconstruction/identification; biometric systems. —S. (S.) Hopkins

212. Scientific Evidence and Courtroom Testimony (3)
Lecture—2 hours; discussion—1 hour. Prerequisite: graduate student enrolled in the MS Forensic Science program or by consent of instructor. Explores the relationship between science and the criminal justice system. Admissibility of scientific testimony and documentary proof during the trial, concepts of relevancy, hearsay and opinion rule, examination of expert witnesses, impeachment of Kellogg & Davenport decisions & court testimony. —W. (W.) Chamberlain, Mauclerci

215. Forensic Fire and Arson Investigation (3)
Lecture—3 hours. Prerequisite: open only to students enrolled in the M.S. Forensic Science program or by consent of the Forensic Science Program Director. Principles and techniques of scientific investigation of fires and related crimes; fire & explosion scenes; fire scene investigation; arson detection; fire and explosion scene; forensic science reports. Offered in alternate years. —S. (S.) DeHaan

218. Technical Writing in Forensic Science (3)
Lecture—2 hours; extensive writing or discussion—1 hour. Restrictions: open only to the instructor required for all students not enrolled in the Forensic Science program. Restricted to graduate standing in the Forensic Science program. How to write clear, credible forensic science reports and scientific articles, that (a) serve the ends of the justice system, (b) meet their readers’ varying needs and (c) reflect well on the author. —F. (F.) Neumann

220. Analysis of Toxicants (3)
Lecture—3 hours. Prerequisite: coursework in organic chemistry. Principles of microanalysis of toxicants. Theoretical considerations regarding separation, detection and quantitative determination of toxicants using chemical and instrumental techniques. (Same course as Environmental Toxicology 220.) —F. (F.) Zhang

221. Forensic Science Analytical Instrumentation (2)
Lecture/discussion—1 hour; laboratory—3 hours. Methodology and instruments used for the analysis of substances of interest in the discipline of Forensic Science. Practical experience with modern instrumental techniques & methodologies used in the advanced forensic science laboratory. Restricted to students accepted in the Forensic Science Graduate Program or by consent of Forensic Science Program Director. Statistics that are used by the forensic scientist, their limitations/applications in the forensic science issues in the evaluation of digital evidence. —W. (W.) Land

240. Homicide Crime Scene Investigation (3)
Lecture—2 hours; laboratory—3 hours. Restricted to Forensic Science Masters Program Students; enrollment is limited to 15 students per class. Processing and evaluating complex homicide scenes. Functions and activities of police agencies. Recognizing, documenting, identification, and collection of evidence. Event sequence reconstruction. Evidence collection, preservation, report writing. Courtroom presentation. —F. (F.) S. (S.) Hopkins

263. Forensic Computer Science Investigations (3)
Lecture—3 hours. Prerequisite: graduate student; consent of instructor. Restricted to students in the Forensic Science Graduate Program unless approved by instructor. Discuss the threats to the security of any kind of evidence that is captured, transmitted, or stored digitally and develop critical thinking and basic knowledge of computer forensic science issues in the evaluation of digital evidence. —S. (S.)

268. Statistics in Forensic Science (3)
Lecture—3 hours. Prerequisite: consent of instructor. Restricted to students enrolled in the M.S. in Forensic Science Program or by consent of Forensic Science Program Director. Statistics that are used by the forensic scientist, their limitations/applications in presenting evidential results including DNA/STR results, trace evidence correlation, fingerprint statistics, population sampling and the Bayes method. Offered in alternate years. —W. (W.)