

BACKGROUND

From the Graduate Group in Food Science Degree requirements (3/19/2021):

Students must take at least 10 units (MS program) and 12 units (PhD program) of specialized courses reviewed by their Major Professor and approved by their Graduate Advisor. These electives are expected to encompass topics relevant to performing masters or doctoral research and include the major disciplinary areas of including (bio)chemistry, processing, food sustainability, fermentation, microbiology, and sensory and social science. Prerequisites for the required core courses can be included among the electives, however, at least 6 units (MS program) or 8 units (PhD program) of the elective courses must be graduate division courses (200 series). These units cannot include FSGG core courses. Students may request that an upper division undergraduate course (100 series) be included among those 6 (MS) or 8 (PhD) units of electives, if a similar course on that topic is not offered at the graduate level (200 series) and the course is deemed necessary for the student by the Major Professor. Students must submit such requests to the Graduate Advisor and the final decision is made by Chair of the Academic Advising Committee.

Courses chosen to satisfy elective requirements must not be taken on a pass/no pass or satisfactory/unsatisfactory basis, with the exception of variable unit classes. The inclusion of any variable unit courses toward these 10 units (MS) or 12 units (PhD) requires the approval of the FSGG Academic Advising Committee.

About this list:

This list contains graduate and undergraduate courses identified by students and faculty as courses that have been used to fulfill elective requirements for the FSGG program. It is not intended to be a complete or exhaustive list since new courses are frequently added and some courses may no longer be taught or taught only on alternate years. Please use this list to help guide your selection of electives. Ultimately consult the UC Davis course catalog (scheduler) and your major professor for other useful courses relevant to your research interests.

GRADUATE LEVEL COURSES**BCM 230—Practical NMR Spectroscopy & Imaging (1 unit)**

Prerequisite(s): CHE 107A; CHE 107B; (PHY 009A, PHY 009B, PHY 009C; or PHY 005A, PHY 005B, PHY 005C) or consent of instructor. Course Description: Basic theory, experimental methods, and instrumentation of NMR. Enables understanding of NMR spectroscopy and imaging experiments. (S/U grading only.)

CHE 240—Advanced Analytical Chemistry (3 units)

Prerequisite(s): CHE 110A; CHE 115; Or equivalent. Course Description: Numerical treatment of experimental data; thermodynamics of electrolyte and non-electrolyte solutions; complex equilibria in aqueous and non-aqueous solutions; potentiometry and specific ion electrodes; mass transfer in liquid solutions; fundamentals of separation science, including column, gas and liquid chromatography.

CHE 241C—Mass Spectrometry (3 units)

Prerequisite(s): CHE 110C; CHE 115; Or equivalent. Course Description: Mass spectrometry and related methods with emphasis on ionization methods, mass analyzers, and detectors. Related methods may include ion-molecule reactions, unimolecular dissociation of organic and bio-organic compounds, and applications in biological and environmental analysis.

ECI 244A - Life Cycle Assessment for Sustainable Engineering (4 units)

Course Description: Life cycle assessment methodology. Emphasis on applications to infrastructure and energy systems. Life cycle design, life cycle cost methods, other tools from industrial ecology, and links to policy.

EBS 265—Design & Analysis of Engineering Experiments (5 units)

Prerequisite(s): STA 100; ASE 120; or an introductory course in statistics. Course Description: Simple linear, multiple, and polynomial regression, correlation, residuals, model selection, one-way ANOVA, fixed and random effect models, sample size, multiple comparisons, randomized block, repeated measures, and Latin square designs, factorial experiments, nested design and subsampling, split-plot design, statistical software packages.

EBS 268—Polysaccharides Surface Interactions (3 units)

Prerequisite(s): Graduate students in science or engineering. Course Description: Study of fundamental surface science theories as applied to physical and chemical interactions of carbohydrates and polysaccharides. (Same course as ECH 268.)

EBS 270—Modeling & Analysis of Physical and Biological Processes & Systems (4 units)

Prerequisite(s): MAT 022B or EBS 130; Familiarity with a programming language. Course Description: Mathematical modeling of biological systems: model development; analytical and numerical solutions. Case studies from various specializations within Biological & Agricultural Engineering.

EGG 200 - Introduction to Energy Systems (4 units)

Course description: The course begins by asking the question: why are energy systems important? To gain insight, we'll survey the history of energy's role in shaping the modern world, power, energy production and energy efficiency. We'll learn where our energy comes from, how it is converted and distributed, and how we use it. We'll discuss resource and environmental constraints on our present energy system and how to make it more sustainable and equitable. By the end of the course, you'll have a broader and deeper understanding of the importance of our energy system, how it works, and pathways to a more sustainable and equitable energy system. This course is applicable to students of many different majors and research interests that intersect with energy.

ETX 220—Analysis of Toxicants (3 units)

Prerequisite(s): Coursework in organic chemistry. Course Description: Principles of microanalysis of toxicants. Theoretical considerations regarding separation, detection and quantitative determination of toxicants using chemical and instrumental techniques. (Same course as FOR 220.)

ETX 220L—Analysis of Toxicants Laboratory (2 units)

Prerequisite(s): ETX 220 (can be concurrent); and Consent of Instructor. Course Description: Laboratory techniques for microanalysis of toxicants. Separation, detection, and quantitative determination of toxicants using chemical and instrumental methods.

FST 202 — Physical Chemistry of Foods (4 units)

Prerequisite(s): CHE 107A; CHE 107B; BIS 102 recommended. Course Description: 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.

FST 211—Lipids: Chemistry and Nutrition (3 units)

Prerequisite(s): BIS 103, CHE 107B, CHE 128B. Course Description: Chemistry of lipids as it pertains to research in food and nutrition. Relations between lipid structure and their physical properties in tissues and foods. Regulation of absorption, transport, and metabolism of lipids. Implications of dietary fats and health.

FST 217 — Advanced Food Sensory Science (3 units)

Prerequisite(s): FST 117 or consent of instructor. Course Description: Advanced study of the techniques and theory of the sensory measurement of food as an analytical tool and as a measure of consumer perception and acceptance. Advanced examination of the sensory and cognitive systems associated with the perception of food.

FST 227—Food Perception and the Chemical Senses (2 units)

Prerequisite(s): FST 107B. Course Description: Examination of the anatomy and physiology of the chemical senses (taste, smell, and the trigeminal senses) and how they are involved in the perception of food and food intake.

FST 228—Sustainable Food Systems (3 units)

Course Description: Environmental impacts of food systems. Methods for quantifying resource use and managing waste for food production and processing. Influence of policies, technologies, and consumer demand on advancing sustainable food systems.

FST 230 — Food & Gut Microbiota (4 units)

Prerequisite(s): Microbiology and molecular biology undergraduate coursework or consent of instructor. Course Description: Impact of specific food structures on the structure and function of the animal gut microbiota. How food is transformed by, and modulates, the gut microbiota to provide the host with nutrients and protection.

MIB 200A—Microbial Biology (3 units)

Prerequisite(s): MIC 102; Or equivalent; prior coursework in Microbiology. Course Description: Designed to provide an overview of various aspects of microbiology and microbial processes. Topics will include microbial genetics and genomics, microbial metabolism, signaling, and adaptations.

MIC 215—Recombinant DNA (3 units)

Prerequisite(s): BIS 101; BIS 102; BIS 103; Or the equivalent. Course Description: Application of recombinant DNA technology to modern problems in biology, biochemistry, and genetics,

emphasizing molecular cloning strategies, choice of vectors, preparation of insert DNA, and selection procedures.

NUT 251— Nutrition & Immunity (2 units)

Prerequisite(s): PMI 126; ABI 102; MMI 107; or the equivalent to MMI 107. Course Description: Cellular and molecular mechanisms underlying interactions of nutrition and immune function, including modulation of immunocompetence by diet and effects of immune responses on nutritional needs. Lectures and discussion explore implications for resistance to infection, autoimmunity and cancer.

PLS 205—Experimental Design & Analysis (5 units)

Prerequisite(s): PLS 120; Or equivalent. Course Description: Introduction to the research process and statistical methods to plan, conduct and interpret experiments. Not open for credit to students who have completed AGR 205.

PLS 206—Applied Multivariate Modeling in Agricultural & Environmental Sciences (4 units)

Prerequisite(s): PLS 120; (STA 106 or STA 108 or PLS 205). Course Description: Multivariate linear and nonlinear models. Model selection and parameter estimation. Analysis of manipulative and observational agroecological experiments. Discriminant, principal component, and path analyses. Logistic and biased regression. Bootstrapping. Exercises based on actual research by UC Davis students. Not open for credit to students who have complete AGR 206.

PTX 201 - Principles of Pharmacology and Toxicology (5 units)

Prerequisite(s): BIS 102; NPB 101. Course Description: First of three courses presenting fundamental principles of pharmacology and toxicology. Introductory overview of basic concepts in pharmacology/toxicology, followed by in-depth blocks on fate processes of chemicals in the body, fate processes in tissue selective responses, selective toxicity employed therapeutically.

PTX 202 - Principles of Pharmacology and Toxicology (4 units)

Prerequisite(s): PTX 201. Course Description: Second of three courses presenting fundamental principles of pharmacology and toxicology. Principles of pharmacodynamics and mechanisms of drug/toxicant actions.

STA 200A—Introduction to Probability Theory (4 units)

Prerequisite(s): MAT 021A; MAT 021B; MAT 021C; MAT 022A; Consent of Instructor. Course Description: Fundamental concepts of probability theory, discrete and continuous random variables, standard distributions, moments and moment-generating functions, laws of large numbers and the central limit theorem.

STA 200B—Introduction to Mathematical Statistics I (4 units)

Prerequisite(s): STA 200A; or Consent of Instructor. Course Description: Sampling, methods of estimation, bias-variance decomposition, sampling distributions, Fisher information, confidence intervals, and some elements of hypothesis testing.

STA 200C—Introduction to Mathematical Statistics II (4 units)

Prerequisite(s): STA 200B; or Consent of Instructor. Course Description: Testing theory, tools and applications from probability theory, Linear model theory, ANOVA, goodness-of-fit.

STA 206—Statistical Methods for Research I (4 units)

Prerequisite(s): Introductory statistics course; some knowledge of vectors and matrices. Course Description: Focus on linear statistical models. Emphasis on concepts, method and data analysis. Topics include simple and multiple linear regression, polynomial regression, diagnostics, model selection, factorial designs and analysis of covariance. Use of professional level software.

VEN 215—Sensometrics (3 units)

Prerequisite(s): FST 117; ((VEN 125, VEN 125L) or (FST 107A or FST 107B)); Or equivalent to FTS 117. Course Description: Experimental design and statistical analysis, including multivariate analysis, for both sensory and instrumental data in enology and food-related studies.

VEN 219—Natural Products of Wine (3 units)

Prerequisite(s): VEN 123; VEN 124; or natural products background, and consent of instructor. Course Description: Structure, occurrence, and changes due to wine production to the natural products found in wine. Chemicals with a sensory impact will be emphasized, including flavonoids and other phenolics, terpenes and norisoprenoids, pyrazines, oak volatiles and other wine constituents.

VMB 220— Oxidative Stress & Free Radical Signaling (2 units)

Prerequisite(s): Advanced undergraduates, graduates, and professional students with a solid background in biochemistry and physiology. Course Description: Nature of nitrogen and oxygen radicals, their role in health, disease, medicine, toxicology, pharmacology, and related disciplines. Free radicals, antioxidants, and biological pathways. Clinical cases of increased oxidative stress.

UNDERGRADUATE COURSES

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CHE 107A—Physical Chemistry for the Life Sciences (3 units)

Prerequisite(s): CHE 002C or CHE 002CH; (MAT 016C or MAT 017C or MAT 021C); (PHY 007C or PHY 009C or PHY 009HC). Course Description: Physical chemistry intended for majors in the life science area. Introductory development of classical and statistical thermodynamics including equilibrium processes and solutions of both nonelectrolytes and electrolytes. The thermodynamic basis of electrochemistry and membrane potentials.

CHE 107B—Physical Chemistry for the Life Sciences (3 units)

Prerequisite(s): CHE 107A. Continuation of CHE 107A. Course Description: Kinetic theory of gases and transport processes in liquids. Chemical kinetics, enzyme kinetics and theories of reaction rates. Introduction to quantum 956 theory, atomic and molecular structure, and spectroscopy. Application to problems in the biological sciences.

FST 114 — Fermented Foods (4 units)

Prerequisite(s): BIS 103; MIC 102; or consent of instructor. Course Description: Physiology, biochemistry, and genetics of microorganisms important in food fermentations. How microorganisms are used in fermentations and how raw materials are converted into finished fermented foods and beverages.

FST 117 — Design & Analysis for Sensory Food Science (4)

Prerequisite(s): STA 013. Course Description: Methods of design and analysis for sensory food science. Experimental design strategies. Use of taste panels and consumer testing. Data analysis and computation including the relative merits and limitations of parametric and nonparametric approaches.

FST/ETX 128 Food Toxicology (3 units)

Prerequisite(s): BIS 102; BIS 103. Course Description: 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.

MCB 123 Behavior & Analysis of Enzyme & Receptor Systems (3 units)

Course Description: Introduction to the principles of enzyme kinetics and receptor-ligand interactions with emphasis on metabolic regulation and data analysis. Topics include simultaneous equilibria, chemical and steady-state kinetics, allosteric enzymes, multi-reactant systems, enzyme assays, membrane transport and computer-assisted simulations and analyses.

NUT 104— Environmental & Nutritional Factors in Cellular Regulation & Nutritional Toxicants (3 units)

Prerequisite(s): BIS 101; (BIS 103 or ABI 103). Course Description: Cellular regulation from nutritional/toxicological perspective. Emphasis: role of biofactors on modulation of signal transduction pathways, role of specific organelles in organization/regulation of metabolic transformations, major cofactor functions, principles of pharmacology/toxicology important to understanding nutrient/toxicant metabolism.

NUT 105— Nutrition through the Life Cycle (3 units)

Prerequisite(s): (BIS 103 or ABI 103); NUT 111AY; or consent of instructor. Course Description: Unique nutrient needs of people in different stages of the life cycle, including pregnant and lactating women, infants, children, adolescents, adults and the elderly. Physiological changes and conditions that influence nutrient needs, factors that influence food choices and appropriate dietary recommendations, and recent research are discussed.

PLS 173—Molecular & Cellular Aspects of Postharvest Biology (3 units)

Prerequisite(s): PLS 002 or BIS 001C or BIS 002C; Or equivalent. Course Description: Basic concepts and current knowledge of issues relevant to postharvest biology. Mechanisms of fruit ripening, senescence, programmed cell death. Metabolism and functions of phytohormones,

carbohydrates, lipids, pigments, flavor compounds, and phytonutrients at molecular and cellular levels.

PLS 174—Microbiology & Safety of Fresh Fruits & Vegetables (3 units)

Prerequisite(s): PLS 002 or BIS 001C or BIS 002C; Or equivalent. Course Description: Overview of microorganisms on fresh produce, pre- and postharvest factors influencing risk of microbial contamination, attachment of microorganisms to produce, multiplication during postharvest handling and storage, and methods of detection. Mock outbreak trial and presentation of science-based forensic discovery.

STA 106—Applied Statistical Methods: Analysis of Variance (4 units)

Prerequisite(s): STA 013 C- or better or STA 013Y C- or better or STA 032 C- or better or STA 100 C- or better. Course Description: Basics of experimental design. One-way and two-way fixed effects analysis of variance models. Randomized complete and incomplete block design. Multiple comparisons procedures. One-way random effects model.

STA 141B—Data & Web Technologies for Data Analysis (4 units)

Prerequisite(s): STA 141A C- or better. Pass One and Pass Two restricted to Statistics majors and graduate students in Statistics and Biostatistics. Open to all students during Open Registration. Course Description: Essentials of using relational databases and SQL. Processing data in blocks. Scraping Web pages and using Web services/APIs. Basics of text mining. Interactive data visualization with Web technologies. Computational data workflow and best practices. Statistical methods.

VEN 125—Wine Types & Sensory Evaluation (2 units)

Prerequisite(s): PLS 120 or STA 106. Open to upper division and graduate students in Viticulture & Enology; others by approval of instructor. Course Description: Principles of sensory evaluation and application to wines. Factors influencing wine flavor, data from sensory analysis of model solutions.

VEN 125L—Sensory Evaluation of Wine Laboratory (2 units)

Prerequisite(s): VEN 125 (can be concurrent). Restricted to upper division major students in fermentation science or viticulture & enology; graduate students in the food science program. Course Description: Sensory evaluation of wines and model systems using discrimination tests, ranking, descriptive analysis and time-intensity analysis. Data will be analyzed by appropriate statistical tests and the results interpreted in extensive weekly lab reports.