

# FOOD SCIENCE (FDSC)

## FDSC 500A: Fundamentals of Food Science - Microbiology

1 Credits

Overview of the field of Food Science with the focus on microbiology. FD SC 500A Fundamentals of Food Science - Microbiology (1) An overview of the field of food microbiology required of all entering graduate students majoring in food science. Students will acquire knowledge of the core concepts pertaining to the general topics of food microbiology. Upon completion, the student will be familiar with the primary sources of information related to the field. The course provides background material for more advanced and specialized graduate-level courses in food science and will be offered each fall semester.

## FDSC 500B: Fundamentals of Food Science - Engineering

1 Credits

Overview of the field of Food Science with the focus on engineering. FD SC 500B Fundamentals of Food Science - Engineering An overview of the field of food engineering required of all entering graduate students majoring in food science. Students will acquire knowledge of the core concepts pertaining to the general topics of food engineering. Upon completion, the student will be familiar with the primary sources of information related to the field. The course provides background material for more advanced and specialized graduate-level courses in food science and will be offered each fall semester.

## FDSC 500C: Fundamentals of Food Science - Chemistry

1 Credits

Overview of the field of Food Science with the focus on chemistry. FD SC 500C Fundamentals of Food Science - Chemistry (1) An overview of the chemistry underlying the properties of food. Students will be introduced to the major chemical components of food along with the reactions occurring during manufacturing and storage that can impact food quality and safety. The material will be taught through a combination of lectures and selected readings pertaining to the field of food chemistry. Upon completion, students will be able to explore how these topics can be practically addressed as research questions through the analysis of papers from recent guided readings. The course provides background material for more advanced and specialized graduate-level courses in food science and will be offered each spring semester.

## FDSC 500D: Fundamentals of Food Science - Nutrition

1 Credits

Overview of the applications of nutrition in the field of Food Science. FD SC 500D Fundamentals of Food Science - Nutrition An overview of the role that nutrition research and recommendations play in labeling regulations and product development of manufactured foods. The student will acquire a very basic understanding of human carbohydrate, protein and fat metabolism and how the public health concern about chronic disease has influenced the Nutrition Facts panel and the use of health claims. Case studies of several functional ingredients (including fat replacers) developed by the food industry in response to nutrition recommendations will be examined.

## FDSC 501: Research Methods in Food Science

2 Credits

Planning and conducting research in food science including: problem definition, experimental design, collecting and recording data, and effective communication. FD SC 501 Research Methods in Food Science (2) FD SC 501 is designed to develop and improve research skills and prepare students for professional careers. The course will guide the student from problem selection to a completed research report. Along the way the student will come to appreciate the philosophical underpinnings of the research enterprise and understand how a research project is conducted in a professional and acceptable manner. The course will provide an overview of statistical techniques used for data analyses and protocols necessary to conduct research using human and animal subjects. Emphasis will be given to learning and improving written and oral communication skills. Students will learn by identifying funding sources, writing a research grant proposal and presenting the same to an audience. Subtleties of writing skills for peer-reviewed journals and corporate reports will be highlighted. Performance in the course will be evaluated based on written and oral presentations and class participation. A variety of audio-visual tools will be available to make presentations in the class. The course will be offered every spring semester.

## FDSC 506: Flavor Chemistry

3 Credits

Formation, analysis and release of flavors in food systems.

**Prerequisite:** FD SC400

## FDSC 507: Advanced Food Microbiology

3 Credits

Roles of microorganisms in food preservation, spoilage, health and disease. Recent advances in detection, tracking and control of foodborne pathogens. FD SC 507 Advanced Food Microbiology (3) FD SC507 is an intensive graduate course in food microbiology. Students will acquire knowledge of the core concepts pertaining to the roles of microorganisms in food preservation, spoilage, human health and disease. Special emphasis will be given to recent advances in molecular biology, genomics and bioinformatics that enhance the detection and tracking of foodborne pathogens. Upon completion of the course, students will be able to critically evaluate primary sources of information related to the field and be able to apply their knowledge to the development of effective risk assessment and risk management systems for ensuring food safety. Students will be able to critically analyze current food microbiology research publications and assess the quality of research publications in the field of food microbiology. Performance will be assessed through two exams, two quizzes, presenting and leading critical discussions of journal articles, and participating in class discussions. Resources will include an advanced-level text, other hardcopy and electronic resources and primary literature. The course will be offered every other year during the spring semester.

**Prerequisite:** FD SC408 or FD SC500A , and a 400-level course either biochemistry or molecular biology

## FDSC 510: Carbohydrate Hydrocolloids

3 Credits

Physicochemical behavior of edible carbohydrate hydrocolloids, with emphasis on starch and selected exudates, extracts, flours, and fermentation products.

**Prerequisite:** BIOCH401

## FDSC 511: Enzymes in Food

3 Credits

The food enzymes market is currently worth billions of dollars while being projected to continue to experience robust growth rates for the foreseeable future. Enzymes are thus becoming an increasingly important part of the food industry, either allowing for new processes or replacing existing chemical catalysts. As consumers become more wary of chemicals added to their foods, enzymes are increasingly being viewed as a more natural solution to food processing challenges. Besides these added enzymes, many foods contain their own enzymes that contribute to and present challenges with food quality and stability. Furthermore, microorganisms responsible for food fermentations and spoilage of foods contain their own enzymes that are ultimately driving these processes. In this course students will learn about the use and manipulation of enzymes in the food industry during processing and fermentation as well as those enzymes naturally present in food and present in spoilage organisms and food borne pathogens. Students will come away from this course with knowledge about the chemistry catalyzed by these enzymes and how they can be exploited and controlled in the food industry to achieve the desired food quality and stability. This will include deeper investigations into both key enzymes in food processing and those of particular relevance to the students; research through paper discussions and student-led discussions of relevant enzymes. Thus, students will finish this course better prepared not only to tackle enzyme-related challenges in the food industry, but also aspects of their own research projects that involve enzymes.

**Recommended Preparations:** It is recommended that students have taken an introductory biochemistry course.

## FDSC 514: Food Physical Chemistry

3 Credits

Physical principles underlying food structure and quality. FD SC 514 Food Physical Chemistry (3) Food structure occurs over many scales ranging from the molecular to the macroscopic pieces consumed. We are interested in small scale behaviors as they determine larger scale structures and hence the bulk functionality of foods as materials (e.g., texture, physical stability). The structure of food arises from the molecular interactions of its ingredients as modified by the processing conditions applied. Food is rarely at a thermodynamic equilibrium so time-dependency and kinetics are particularly important. In this class, the students will develop an understanding of the structures occurring (e.g., crystals, gels, colloids), how they form, and how they affect the functional properties of foods. Students will gain knowledge and understanding of the relevant principles through a variety of guided readings and lectures. They will then apply this knowledge in critical discussions of primary research articles. Finally the students will use the knowledge gained in a research project where they will be asked to explain the physics associated with a specific food product or process. Students will be

evaluated by a combination of in-class tests, a participation grade, examinations (mid-term and final) and a project. The course will be offered alternating spring semesters.

**Prerequisite:** FD SC400 or FD SC500C

## FDSC 515: Sensometrics - Applied Multivariate Analysis in Sensory &amp; Food Science

3 Credits

The main objective of this course is to allow each student to develop the necessary data analysis skills needed for analyzing and interpreting sensory and consumer data. Additionally, students will develop an understanding for experimental designs and statistical analyses to plan, analyze, and interpret data collected from sensory studies. Hands-on experiences in analyzing sensory data will be provided through homework assignments in each week, and discussions of appropriate literature where indicated. Topics covered in this course will include experimental design and data visualization, data analysis of discrimination tests, analysis methods for descriptive data, approaches for understanding consumer results and identifying drivers of liking, as well as novel statistical methods for alternative descriptive methods (sorting, napping, check-all-that-apply, etc.), ways of analyzing temporal sensory data, and correlating sensory data to other data, such as demographics or instrumental analyses. Discussion of current literature, where appropriate, will showcase how these methods are applied in the "real world", and further the understanding of how these methods are used, and interpreted. In addition, students will develop and further their critical thinking and communication skills.

**Prerequisite:** STAT 500; or BBH 505 RECOMMENDED PREPARATIONS: STAT 484 STAT 485 FDSC 404

## FDSC 516: Consumer Insights

3 Credits

This course aims to allow each student to develop and apply the fundamental dimensions and value of consumer insights to product development objectives; implement key qualitative, quantitative, and hybrid approaches for consumer insights; recognize, identify, and apply key consumer biases, and examine trade-offs in research and consumer behavior. Topics covered in the course start with understanding the consumer and key consumer biases and move to objective-based consumer research design including qualitative, quantitative, and hybrid approaches. In addition, research in the fuzzy front end, utilizing social listening as well as new technology in consumer research will be discussed. Throughout, an objective-based framework will be applied where the consumer is at the center and insights are developed related to how consumer interact with products. In addition, the real-world practical examples and assignments will be utilized extensively for real world application. Taken together, this will allow students to develop and further their critical thinking and communication skills.

**CONCURRENTS:** STAT 500

## FDSC 517: Microbial Genomic Epidemiology

3 Credits

This course gives students an overview of the sequencing technologies and genomic sequence data analyses (e.g., sequence pre-processing, assembly) and demonstrates their application in the context of epidemiology (e.g., identification of single nucleotide polymorphisms

and genes of interest). The course covers the concepts necessary to carry out comparative genomics analyses and interpret the results in the context of an outbreak investigation. These concepts are then applied in a practical sequence-analyses case study focused on the development of prokaryotic whole-genome sequence data analysis skills. Lastly, students are guided in the application of gained knowledge and skills through final projects.

**Recommended Preparations:** Students are recommended to complete a 400-level course in microbiology, molecular biology, or biochemistry prior to taking this course

#### FDSC 521: Food Defense: Prevention Planning for Food Processors

3 Credits

Course prepares current and aspiring professionals to learn, recognize and apply measures to prevent intentional contamination of the food supply. FD SC (AGBIO) 521 Food Defense: Prevention Planning for Food Processors (3) This course will not only provide participants with knowledge of the domestic and international food industry, but it also provides tools for food industry and homeland security professionals to develop food defense programs to protect the food supply from terroristic activities leading to intentional contamination. The course will introduce and apply: examples where intentional contamination has been used in the food industry; biological, chemical and physical hazards of primary concern in the food industry; methods for detecting hazards in the food supply; systems employed to monitor foodborne illness in the general public; management practices employed in food production to deal with recalls and other crises; vulnerabilities and mitigation procedures unique to food production; as well as agencies, resources, and tools needed to protect, prepare, and respond to intentional contamination incidents. This course is a required course for the certificate program in Agricultural Biosecurity as well as the Master of Professional Studies in Homeland Security/Agricultural Biosecurity Option. These principles also will be incorporated into a food defense plan, recall plan, and emergency preparedness plan for an assigned food establishment.

Cross-listed with: AGBIO 521

#### FDSC 525: Culture Based Analysis of Microorganisms

3 Credits

In a world where genomics/metagenomics techniques are becoming increasingly prevalent our knowledge about the genetic potential of organism is far outstripping our knowledge about how these organisms utilize this potential during growth. It is becoming more important than ever to design and execute culture-based experiments to test the hypotheses generated from our genetic knowledge of these bacteria. This course has been developed to teach students to design and execute culture-based experiments and to complement courses tailored to studying organisms from genetic and ecological perspectives. Additionally, there have been exciting developments in microbial culture that are allowing much of the diversity of microorganisms that are being discovered to be cultured for the first time. This course will explore the culture of microorganisms from both a theoretical and practical perspective with two lectures and one lab per week. Students will learn about culturing bacteria from diverse environments and with a variety of growth requirements using both traditional and cutting-edge methods. The design of experiments involving culturing bacteria will be a key focus and students will design their own culturebased experiment to explore a question of interest. Overall, the learning objectives for students taking the course are: 1) Be able to describe the key factors that determine the

culturability of a microorganisms and methods for developing successful culture conditions, 2) Design experiments to isolate and or investigate bacteria of interest in a culture dependent manner, 3) Analyze data derived from bacterial cultures. These objectives will be explored in the context of monocultures, co-cultures and complex community cultures of microorganisms, which will leave students with the tools to answer a wide variety of questions using culture-based techniques.

**Recommended Preparations:** It is recommended that students have completed an introductory microbiology course.

#### FDSC 526: Microbial Physiology of Foodborne Organisms

3 Credits

A current literature-based course investigating the mechanisms by which foodborne bacteria (beneficial and pathogenic) grow, survive, and react to environments encountered in foods and during food processing.

#### FDSC 534: Readings in Ingestive Behavior

1 Credits/Maximum of 6

Students lead discussions of original research in the field of ingestive behavior; focus on food intake in particular. FDSC 534 / NUTR 534 Readings in Ingestive Behavior (1 per semester/maximum of 6) The class provides a forum for students to learn to lead a discussion focused on original research in the field of ingestive behavior. In addition, it provides the opportunity for students to become familiar with the broad range of topics relevant to this field of research. While the primary focus is on the consumption of food, other relevant topics (obesity, eating disorders, fluid intake) also are included. Research topics include both basic and applied areas.

Cross-listed with: NUTR 534

#### FDSC 596: Individual Studies

1-9 Credits/Maximum of 9

Creative projects, including nonthesis research, that are supervised on individual basis and fall outside the scope of formal courses.

#### FDSC 597: Special Topics

1-9 Credits/Maximum of 9

Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.

#### FDSC 600: Thesis Research

1-15 Credits/Maximum of 999

No description.

#### FDSC 601: Ph.D. Dissertation Full Time

0 Credits/Maximum of 999

No description.

FDSC 602: Supervised Experience in College Teaching

1-3 Credits/Maximum of 6

Supervised experience in the development of instructional materials, the organization and conduct of lectures/laboratories, the evaluation and counseling of students.

FDSC 603: Foreign Academic Experience

1-12 Credits/Maximum of 12

Foreign study and/or research approved by the food science program constituting progress toward the degree.

FDSC 610: Thesis Research Off Campus

1-15 Credits/Maximum of 999

No description.

FDSC 611: Ph.D. Dissertation Part-Time

0 Credits/Maximum of 999

No description.