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# Toxicology

## Minor

The Department of Nutritional Science and Toxicology (NST) offers a minor in Toxicology. The course work for the minor addresses topics in the basic principles of toxicology and molecular toxicology as well as computational toxicology, pharmacology, and pesticide chemistry. The minor works best for students already pursuing a bioscience degree as a background in chemistry, organic chemistry, biology, and biochemistry is necessary to be prepared to do upper division work in this field.

Currently, there is no major program in Toxicology.

# **Declaring the Minor**

For information regarding how to declare the minor, please contact the Department.

# Other Major and Minor Offered by the Department of Nutritional Sciences and Toxicology

Nutritional Science (http://guide.berkeley.edu/archive/2014-15/ undergraduate/degree-programs/nutritional-science) (Major and Minor)

Students who have a strong interest in an area of study outside their major often decide to complete a minor program. These programs have set requirements and are noted officially on the transcript in the memoranda section, but they are not noted on diplomas.

# **General Guidelines**

- 1. All courses taken to fulfill the minor requirements below must be taken for graded credit.
- 2. A minimum grade point average (GPA) of 2.0 is required for courses used to fulfill the minor requirements.
- No more than one upper-division course may be used to simultaneously fulfill requirements for a student's major and minor programs.

At least one of the five upper-division courses below must be taken during the academic year (i.e., not all courses may be Summer Session courses).

No substitutions to the courses listed below will be permitted.

# **Lower-division Prerequisites**

CHEM 1A	General Chemistry	3
СНЕМ ЗА	Chemical Structure and Reactivity	3
CHEM 3B	Chemical Structure and Reactivity	3
BIOLOGY 1A	General Biology Lecture	3

# **Minor Requirements**

NUSCTX 11	Introduction to Toxicology	3
NUSCTX 110	Toxicology	4

NI ES	JSCTX C114/ SPM C148	Pesticide Chemistry and Toxicology	3
NI	JSCTX 115	Principles of Drug Action	2
Se	elect at least one	e elective from the following:	
	NUSCTX 103	Nutrient Function and Metabolism	
	NUSCTX 104	Human Food Practices	
	NUSCTX 108A	Introduction and Application of Food Science	
	NUSCTX 121	Computational Toxicology	
	NUSCTX/ ESPM C159	Human Diet	
	NUSCTX 160	Metabolic Bases of Human Health and Diseases	
	NUSCTX 161A	Medical Nutrition Therapy	
	NUSCTX 166	Nutrition in the Community	
	NUSCTX 190	Introduction to Research in Nutritional Sciences	
	NUSCTX 193	Introduction to Research in Toxicology	
	NUSCTX H196	Honors Research	
	NUSCTX 199	Supervised Independent Study and Research	

# Toxicology

NUSCTX 10 Introduction to Human Nutrition 3 Units

This course provides an overview of digestion and metabolism of nutrients. Foods are discussed as a source of nutrients, and the evidence is reviewed as to the effects of nutrition on health. The emphasis of the course is on issues of current interest and on worldwide problems of food and nutrition. Students are required to record their own diet, calculate its composition, and evaluate its nutrient content in light of their particular needs.

#### **Rules & Requirements**

**Credit Restrictions:** Students will receive no credit for 10 after taking 103 or 160.

#### Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

#### Summer:

6 weeks - 6 hours of lecture and 1.5 hours of discussion per week 8 weeks - 4 hours of lecture and 2 hours of discussion per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

#### NUSCTX 11 Introduction to Toxicology 3 Units

Discussion of principles for the evaluation of toxic hazard of natural and man-made substances present in the environment, the workplace, food, drink, and drugs. The bases for species selectivity, individual variations in sensitivity and resistance, and the combined effects of toxic agents will be addressed. Issues related to the impact of toxic agents in modern society will be emphasized.

#### **Rules & Requirements**

Prerequisites: Open to students pursuing science and non science majors

#### Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

#### Additional Details

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Vulpe, Nomura, Wang

#### NUSCTX 24 Freshman Seminar 1 Unit

The Freshman Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Freshman seminars are offered in all campus departments, and topics vary from department to department and semester to semester.

#### **Rules & Requirements**

**Repeat rules:** Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

#### Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

**Grading/Final exam status:** The grading option will be decided by the instructor when the class is offered. Final exam required.

Instructor: Chang

Formerly known as: Nutritional Sciences 24

#### NUSCTX 98 Directed Group Study 1 - 3 Units Study of special topics in nutritional sciences that are not covered in depth in regular courses. **Rules & Requirements**

Prerequisites: Lower division standing and consent of instructor

**Repeat rules:** Course may be repeated for credit. Course may be repeated for credit when topic changes.

#### Hours & Format

Fall and/or spring: 15 weeks - 1-3 hours of directed group study per week

#### Summer:

6 weeks - 3-8 hours of directed group study per week 8 weeks - 2-6 hours of directed group study per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Formerly known as: Nutritional Sciences 98

NUSCTX 103 Nutrient Function and Metabolism 3 Units Delivery of nutrients from foods to mammalian cells; major metabolic pathways; function of nutrients in energy metabolism, nitrogen and lipid metabolism, structural tissues and regulation; essentiality, activation, storage, excretion, and toxicity of nutrients. **Rules & Requirements** 

**Prerequisites:** 10, Molecular and Cell Biology 32, and Molecular and Cell Biology 102 (may be taken concurrently), or consent of instructor

#### Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Sul, Chen

#### NUSCTX 104 Human Food Practices 2 Units

Historical, geo-ecological, biological, cultural, socio-economic, political and personal determinants of human diets. Community food and nutrition problems and programs. Food safety and consumer protection. Contributes to the pursuit of multidisciplinary degrees in nutrition policy and planning.

#### **Rules & Requirements**

Prerequisites: 10 recommended

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Summer: 6 weeks - 5 hours of lecture per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

NUSCTX 108A Introduction and Application of Food Science 3 Units Evaluation of the chemical, physical, functional, and nutritional properities of foods. Emphasis on how these properties, and prepration, processing, and storage, influence quality characteristics of food products. **Rules & Requirements** 

**Prerequisites:** Molecular and Cell Biology 102 (may be taken concurrently), or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

#### Instructor: Rasmussen

NUSCTX 108B Application of Food Science Laboratory 1 Unit Experimental evaluation of the chemical, physical, functional, and nutritional properties of foods, and the changes occuring during preparation that affect quality characteristics of food products. **Rules & Requirements** 

Prerequisites: 108A or concurrent enrollment

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of laboratory per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Rasmussen

#### NUSCTX 110 Toxicology 4 Units

A comprehensive survey of the principles of modern toxicology and their applications in evaluating the safety of foods, additives and environmental contaminates. Mechanisms of metabolic activation, detoxification, gene regulation, and selective toxicity are emphasized. **Rules & Requirements** 

**Prerequisites:** Molecular and Cell Biology 102 (may be taken concurrently), or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Wang, Nomura

NUSCTX C114 Pesticide Chemistry and Toxicology 3 Units Chemical composition of pesticides and related compounds, their mode of action, resistance mechanisms, and methods of evaluating their safety and activity.

#### **Rules & Requirements**

**Prerequisites:** Introductory courses in organic chemistry and biology, or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

**Additional Details** 

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Casida

Also listed as: ESPM C148

#### NUSCTX 115 Principles of Drug Action 2 Units

Basic principles and quantitative aspects of drug action and risk/ benefit as applied to the discovery, design, and development of human therapeutics. The course will highlight the importance of integrating pharmacology, toxicology, and pharmacokinetics to create effective and safe treatments for human disease. Special emphasis will be placed on pharmacogenomics and variation in individual response.

#### **Rules & Requirements**

**Prerequisites:** 110, 120 (may be taken concurrently), and Molecular and Cell Biology 102

#### Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

#### Instructor: Johnson

#### NUSCTX 121 Computational Toxicology 3 Units

Introducing the use of bioinformatics tools useful in linking the molecular structure of chemicals to the toxicity they induce in biological systems. Discussions on the highly interactive process of collecting, organizing, and assimilating chemistry and toxicology information - and the use of computer programs to visualize, browse, and interpret this information to discover chemical structure-toxicity correlations. The importance of these concepts in drug discovery and development and food safety will be emphasized.

#### **Rules & Requirements**

Prerequisites: 110, 120 (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

**Additional Details** 

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Johnson

Formerly known as: Nutritional Sciences 121

NUSCTX 135 Food Systems Organization and Management 4 Units Principles of organization and management applied to institutional food service systems: production and delivery systems, management of resources, quality assurance, equipment, layout, marketing, personnel management, fiscal management. Laboratory experiences, projects and field work in institutional situations. **Rules & Requirements** 

# Prerequisites: Consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 3 hours of fieldwork per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

#### Instructor: Rasmussen

NUSCTX 145 Nutrition Education and Counseling 2 Units This course will focus on communicating nutrition messages through nutrition education and nutrition counseling. Students will develop and implement theory-based nutrition education interventions and conduct mock counseling sessions for various populations and conditions. Strategies for effective nutrition instruction, counseling, and behavior change will be discussed.

#### **Rules & Requirements**

**Prerequisites:** 161A and 161B or concurrent enrollment in these courses. Dietetic majors only

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

**Additional Details** 

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: McCoin

#### NUSCTX C159 Human Diet 4 Units

Since we eat every day, wouldn't it be useful to learn more about human dietary practices? A broad overview of the complex interrelationship between humans and their foods. Topics include the human dietary niche, biological variation related to diet, diet and disease, domestication of staple crops, food processing techniques and development of regional cuisines, modern diets and their problems, food taboos, human attitudes toward foods, and dietary politics.

#### Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

#### Additional Details

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

#### Instructor: Milton

#### Also listed as: ESPM C159

NUSCTX 160 Metabolic Bases of Human Health and Diseases 4 Units The physiological bases of human nutrient homeostasis and common disorders resulting from over and under nutrition will be discussed with a specific focus on macronutrients. Topics related to nutrient deficiency and excess will include adaptation to starvation and the effects of caloric restriction on life-span, obesity and its complications, lipoprotein metabolism and cardiovascular disease, as well as a detailed discussion of the causes, disease mechanisms, and treatment of diabetes mellitus. **Rules & Requirements** 

Prerequisites: 103, or Molecular and Cell Biology 102 or equivalent

#### Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

#### Additional Details

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Stahl, Napoli

#### NUSCTX 161A Medical Nutrition Therapy 4 Units

This lecture course addresses nutrition as a component of disease treatment. As we explore medical nutrition therapy, we will also study disease pathophysiology, diagnosis, and medical and pharmacological treatments. Methods of nutrition assessment and nutrient delivery in a medical setting will be covered.

### **Rules & Requirements**

Prerequisites: 103 and 160

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of lecture per week

**Additional Details** 

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: McCoin

#### NUSCTX 161B Medical Nutrition Therapy II 4 Units

This is the second course of a two part series that is a continuation of addressing nutrition as a component of disease treatment. The Nutrition Care Process will be applied and disease pathophysiology, diagnosis, medical and pharmacological treatments and nutritional therapies for prevention and treatment will be explored for various disease states. **Rules & Requirements** 

**Prerequisites:** Nutritional Science and Toxicology 103, 160, and 161A, or consent of instructor

#### Hours & Format

Fall and/or spring: 15 weeks - 4 hours of lecture per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

#### NUSCTX 166 Nutrition in the Community 3 Units

This course addresses basic nutrition in the context of the community. It explores nutrition programs that serve various segments of the population and the relationships of these programs to nutrition policy at the local, national, and international levels. Community assessment is used as the basis for program planning, implementation, and evaluation. The specific needs of population groups (infants, children, women, and the elderly) are considered and questions of food security are investigated. **Rules & Requirements** 

Prerequisites: 10 recommended; upper division standing required

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

#### Instructor: Henderson

NUSCTX 170 Experimental Nutrition Laboratory 4 Units Basic principles and techniques used in human and animal nutrition research. Students design, execute, and analyze experiments. **Rules & Requirements** 

**Prerequisites:** Nutritional Sciences and Toxicology 103 and a course in statistics

**Credit Restrictions:** Students will receive no credit for Nutritional Sciences and Toxicology 170 after taking Nutritional Science and Toxicology 171 or Nutritional Sciences 171. A deficient grade in Nutritional Sciences 170 may be removed by taking Nutritional Sciences and Toxicology 170.

#### Hours & Format

Fall and/or spring: 15 weeks - 8 hours of laboratory per week

#### Additional Details

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Leitman

NUSCTX 171 Nutrition and Toxicology Laboratory 4 Units Basic principles and techniques used in human and animal nutrition and toxicology research. Students design, execute, and analyze experiments. **Rules & Requirements** 

**Prerequisites:** Nutritional Sciences and Toxicology 110, Molecular and Cell Biology 104 or 142 (may be taken concurrently) or Integrative Biology 141

**Credit Restrictions:** Students will receive no credit for Nutritional Sciences and Toxicology 171 after taking Nutritional Sciences and Toxicology 170 or Nutritional Sciences 170. A deficient grade in Nutritional Sciences 171 may be removed by taking Nutritional Sciences and Toxicology 171.

#### Hours & Format

Fall and/or spring: 15 weeks - 8 hours of laboratory per week

**Additional Details** 

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Leitman

NUSCTX 190 Introduction to Research in Nutritional Sciences 1 Unit Students will be asked to prepare an oral and written report on a topic selected from the current research literature in nutritional sciences. **Rules & Requirements** 

Prerequisites: 103

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

#### NUSCTX 192 Junior Seminar in Dietetics 1 Unit

This seminar course explores the professional roles and responsibilities of dietitians as well as career opportunities within the field. Current issues in the practice of dietetics will be discussed. Students will do research and present an oral report to the class. Each student will begin to develop his or her professional portfolio.

#### **Rules & Requirements**

Prerequisites: Upper division standing and consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

NUSCTX 193 Introduction to Research in Toxicology 1 Unit Students will be asked to prepare an oral and written report on a topic selected from the current research literature in toxicology. **Rules & Requirements** 

Prerequisites: 110 or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

**Additional Details** 

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Kubo

Formerly known as: Nutritional Sciences 193

#### NUSCTX 194 Senior Seminar in Dietetics 2 Units

This course will cover the changes that are occurring in the field of dietetics. Students will explore revisions of the national nutritional standards and guidelines, issues related to complementary and alternative nutrition practices, the area of genomics as it is expected to affect practice, professional ethics in the changing health care environment, reimbursement for professional services, legislation related to the field of dietetics, and other emerging issues. **Rules & Requirements** 

Prerequisites: Upper division standing and consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 1 hour of discussion per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

#### NUSCTX H196 Honors Research 4 Units

Supervised independent honors research specific to aspects of the Nutritional Science and Toxicology major, followed by an oral presentation, and a written report. **Rules & Requirements** 

**Prerequisites:** Upper division standing and minimum GPA. See CNR Honors website for current minimum GPA. http://nature.berkeley.edu/site/ honors\_program.php

**Repeat rules:** Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 12 hours of independent study per week

**Additional Details** 

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Formerly known as: Nutritional Sciences H196

NUSCTX 197 Field Study in Food and Nutritional Sciences 1 - 3 Units Supervised experience in off-campus organizations relevant to specific aspects of foods and nutritional sciences. Regular individual meetings with faculty sponsor and written reports required. **Rules & Requirements** 

**Repeat rules:** Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of fieldwork per week

Summer: 6 weeks - 1-5 hours of fieldwork per week 8 weeks - 1-4 hours of fieldwork per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

NUSCTX 198 Directed Group Study 1 - 3 Units Study of special topics in food science or nutrition that are not covered in depth in regular courses. **Rules & Requirements** 

#### Prerequisites: Consent of instructor

**Repeat rules:** Course may be repeated for credit. Course may be repeated for credit when topic changes.

#### Hours & Format

Fall and/or spring: 15 weeks - 1-3 hours of directed group study per week

#### Additional Details

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Formerly known as: Nutritional Sciences 198

NUSCTX 199 Supervised Independent Study and Research 1 - 4 Units Upper division laboratory and independent research under the direction of a faculty supervisor. Written report required upon completion of the project.

#### **Rules & Requirements**

Prerequisites: Upper division standing and consent of instructor

**Repeat rules:** Course may be repeated for credit. Course may be repeated for credit when topic changes.

#### Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

#### Summer:

6 weeks - 1-3 hours of independent study per week 8 weeks - 1-3 hours of independent study per week

#### **Additional Details**

Subject/Course Level: Nutritional Sciences and Toxicology/ Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.