FOOD SCIENCE, B.S.

Food science is the application of science and engineering to the production, processing, distribution, preparation, and evaluation of food.

The Department of Food Science at the University of Wisconsin–Madison has been a part of the College of Agricultural and Life Sciences for more than 100 years, instructing generations of food science and industry leaders. Housed in the recently remodeled Babcock Hall, the Department of Food Science offers students a truly unique undergraduate experience. Known for our distinguished and dedicated faculty and staff, students find the Department of Food Science a stimulating and encouraging environment to study and conduct research.

The Department of Food Science’s undergraduate program offers students valuable real-world experience and leadership skills by providing an innovative curriculum; varied club and extracurricular activities; research lab opportunities; access to a fully functional and award winning dairy plant; professional and industry contacts and experience; numerous internships and scholarships, and nearly 100% job placement.

Students find career opportunities in product development, quality assurance/control, processing and engineering, technical sales, management, research, sensory analysis, and food law and regulations.

HOW TO GET IN

To declare this major, students must be admitted to UW–Madison and the College of Agricultural and Life Sciences (CALS). For information about becoming a CALS first-year or transfer student, see Entering the College (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/enteringthecollegetext).

Students who attend Student Orientation, Advising, and Registration (SOAR) with the College of Agricultural and Life Sciences have the option to declare this major at SOAR. Students may otherwise declare after they have begun their undergraduate studies. For more information, contact the advisor listed under the Advising and Careers tab.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduatestudytext) section of the Guide.

COLLEGE OF AGRICULTURAL AND LIFE SCIENCES REQUIREMENTS

In addition to the University General Education Requirements, all undergraduate students in CALS must satisfy a set of college and major requirements. Specific requirements for all majors in the college and other information on academic matters can be obtained from the Office of Academic Affairs (http://www.cals.wisc.edu/academics), College of Agricultural and Life Sciences, 116 Agricultural Hall, 1450 Linden Drive, Madison, WI 53706; 608-262-3003. Academic departments and advisors also have information on requirements. Courses may not double count within university requirements (General Education and Breadth) or within college requirements (First-Year Seminar, International Studies and Science), but courses counted toward university requirements may also be used to satisfy a college and/or a major requirement; similarly, courses counted toward college requirements may also be used to satisfy a university and/or a major requirement.

COLLEGE REQUIREMENTS FOR ALL CALS B.S. DEGREE PROGRAMS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td></td>
<td>Quality of Work: Students must maintain a minimum cumulative grade point average of 2.000 to remain in good standing and be eligible for graduation.</td>
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<td>Residency: Students must complete 30 degree credits in residence at UW–Madison after earning 86 credits toward their undergraduate degree.</td>
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<td></td>
<td>First Year Seminar (<a href="http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext">http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext</a>)</td>
<td>1</td>
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<tr>
<td></td>
<td>International Studies (<a href="http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext">http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext</a>)</td>
<td>3</td>
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<tr>
<td></td>
<td>Physical Science Fundamentals</td>
<td>4-5</td>
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<tr>
<td>CHEM 103 or CHEM 108 or CHEM 109</td>
<td>General Chemistry I or Chemistry in Our World or Advanced General Chemistry</td>
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<tr>
<td>Biological Science</td>
<td>5</td>
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<tr>
<td>Additional Science (Biological, Physical, or Natural)</td>
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<tr>
<td>Science Breadth (Biological, Physical, Natural, or Social)</td>
<td>3</td>
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</table>
CALS Capstone Learning Experience: included in the requirements for each CALS major (see "Major Requirements") (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext)

### MAJOR REQUIREMENTS

NUTR SCI/A A E/AGRONOMY/INTER-AG 350 World Hunger and Malnutrition is recommended to fulfill the CALS International Studies requirement.

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<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td></td>
<td><strong>Mathematics and Statistics</strong></td>
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<td>This major requires calculus. Prerequisites may need to taken before enrollment in calculus.</td>
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<td>Select one of the following:</td>
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<tr>
<td>MATH 217</td>
<td>Calculus with Algebra and Trigonometry II ¹</td>
<td>5</td>
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<tr>
<td>MATH 221</td>
<td>Calculus and Analytic Geometry 1</td>
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<td>Select one of the following:</td>
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<tr>
<td>STAT 224</td>
<td>Introductory Statistics for Engineers</td>
<td>3</td>
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<tr>
<td>STAT 301</td>
<td>Introduction to Statistical Methods</td>
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<tr>
<td>STAT 371</td>
<td>Introductory Applied Statistics for the Life Sciences</td>
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<td></td>
<td><strong>Chemistry</strong></td>
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<td>Select one of the following:</td>
<td>5-9</td>
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<tr>
<td>CHEM 103</td>
<td>General Chemistry I</td>
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<tr>
<td>&amp; CHEM 104</td>
<td>and General Chemistry II</td>
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<tr>
<td>CHEM 109</td>
<td>Advanced General Chemistry</td>
<td></td>
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<tr>
<td>CHEM 343</td>
<td>Introductory Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 344</td>
<td>Introductory Organic Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 345</td>
<td>Intermediate Organic Chemistry</td>
<td>3</td>
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<td></td>
<td><strong>Physics</strong></td>
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<td>Select one of the following:</td>
<td>4-5</td>
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<tr>
<td>PHYSICS 201</td>
<td>General Physics</td>
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<tr>
<td>PHYSICS 207</td>
<td>General Physics</td>
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<td></td>
<td><strong>Biology</strong></td>
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<td>Select one of the following (see below):</td>
<td>16-18</td>
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<td></td>
<td>Biochem/Botany/Microbio/Zoology (Path 1)</td>
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<td>Biocore (Path 2)</td>
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<td><strong>Foundation</strong></td>
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<td><em>Econ or Ag &amp; Applied Econ</em></td>
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<td>Select one of the following:</td>
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<tr>
<td>A A E 215</td>
<td>Introduction to Agricultural and Applied Economics</td>
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<td>A A E 323</td>
<td>Cooperatives</td>
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<tr>
<td>ECON 101</td>
<td>Principles of Microeconomics</td>
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<tr>
<td>ECON 111</td>
<td>Principles of Economics-Accelerated Treatment</td>
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<td></td>
<td><strong>Nutritional Science</strong></td>
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<tr>
<td>NUTR SCI/</td>
<td>Biochemical Principles of Human and Animal Nutrition</td>
<td>3</td>
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<tr>
<td>BIOCHEM 510</td>
<td>or NUTR SCI 332 Human Nutritional Needs</td>
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<td></td>
<td><strong>Core</strong></td>
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**FOOD SCI 301 Introduction to the Science and Technology of Food** 3

**AN SCI/Food SCI 321 Food Laws and Regulations** 1

**FOOD SCI/MICROBIO 324 Food Microbiology Laboratory** 2

**FOOD SCI/MICROBIO 325 Food Microbiology** 3

**FOOD SCI 410 Food Chemistry** 3

**FOOD SCI 412 Food Analysis** 4

**FOOD SCI 432 Principles of Food Preservation** 3

**FOOD SCI 440 Principles of Food Engineering** 3

**FOOD SCI 514 Integrated Food Functionality** 4

**FOOD SCI 532 Integrated Food Manufacturing** 4

**Integrated Food Product Elective**

Select one of the following (2 credits minimum): 2

**FOOD SCI 511 Chemistry and Technology of Dairy Products**

**FOOD SCI/MICROBIO 515 Commercial Meat Processing**

**FOOD SCI 535 Confectionery Science and Technology**

**FOOD SCI 550 & FOOD SCI 551 Fermented Foods and Beverages and Food Fermentation Laboratory**

**Science Elective**

Any 400-level or above course with Physical Science designation 3

**Capstone**

**FOOD SCI 602 Senior Project** 2

**FOOD SCI 603 Senior Seminar** 1

Total Credits 85-92

¹ MATH 217 Calculus with Algebra and Trigonometry II requires MATH 171 Calculus with Algebra and Trigonometry I as a prerequisite.
² Both FOOD SCI 550 and either FOOD SCI 551 or FOOD SCI 375 The Science of Wine must be taken.

### BIOLOGY PATHS

**BIOCHEM/BOTANY/MICROBIO/ZOOLOGY (PATH 1)**

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOLOGY/BOTANY/ ZOOLOGY 151</td>
<td>Introductory Biology</td>
<td>5</td>
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Select one of the following: 3-5

Any 400-level or above course with Biological Science designation

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOLOGY/ BOTANY/ ZOOLOGY 152</td>
<td>Introductory Biology</td>
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</table>

**MICROBIO 101 General Microbiology** 3

*or MICROBIO 303 Biology of Microorganisms*

**MICROBIO 102 General Microbiology Laboratory** 2

*or MICROBIO 304 Biology of Microorganisms Laboratory*
HONORS IN THE MAJOR

To earn Honors in the Major, students are required to take at least 20 honors credits. In addition, students must take FOOD SCI 681 Senior Honors Thesis and FOOD SCI 682 Senior Honors Thesis when completing their thesis project; please see the Honors in Major Checklist (http://www.cals.wisc.edu/academics/undergraduate-programs/get-involved/honors-program/honors-in-the-major) for more information.

UNIVERSITY DEGREE REQUIREMENTS

Requirements Detail

Total Degree

To receive a bachelor's degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.

Residency

Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. "In residence" credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.

Quality of Work

Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

LEARNING OUTCOMES

1. Graduates recognize the necessity of continued learning. Graduates will:
   a. Understand that information, knowledge, and technology are always evolving.
   b. Develop a sense of what they know and don’t know (as individuals).
   c. Be receptive to change in technical and professional settings.

2. Graduates are effective communicators. Graduates will:
   a. Write clear and concise technical reports and research articles.
   b. Read for content and quality of literature in the field.
   c. Deliver clear and concise technical presentations.
   d. Communicate clearly scientific principles and data to lay audiences.
   e. Listen intelligently and accept constructive criticisms.
   f. Respect alternative options.

3. Graduates have basic employability skills. Graduates will:
   a. Understand the importance of responsibility, dependability, punctuality, appropriate behavior, and effort in the work place.
   b. Demonstrate the ability to work independently, as well as the ability to work cooperatively in teams.
   c. Recognize changes as part of growth.
   d. Recognize, accept, and respect ethnic and cultural diversity and individual difference.
   e. Commit to the highest standards of professional integrity and ethical value.

4. Graduate have strong quantitative problem solving and critical thinking skills. Graduates will:
   a. Develop ability to deftly apply the scientific method to food science problems: (1) scientific curiosity and observation to detect a problems; (2) define the problem statement; (3) search, explore, and gather evidence; (4) design and implement an experiment to challenge the hypothesis; (7) observe and analyze the results; and (8) reach a conclusion pertinent to the problem statement.
   b. Develop ability to apply quantitative reasoning skills to food science data: (1) recognize and construct a mathematical model that represents quantitative information; (2) analyze and manipulate these models; draw conclusions, predictions, or inferences on the basis of the analysis; and (4) assess the reasonableness of these conclusions.
   c. Develop ability to rigorously apply principles from general chemistry, physics, statistics, and mathematics to food science problems.
   d. Be comfortable with ambiguity in scientific and technical fields.
   e. Develop ability to critically examine technical literature and apply it in the workplace.

5. Graduates are competent in the key aspects of the multidisciplinary nature of food science. Graduates will:
   a. Goals of the program are to have graduates that are competent in the following areas:
      i. Understand the physical, chemical and biological reactions that are important in maintaining food quality and safety, and how to evaluate these changes (analysis).
      ii. Understand the physical, chemical and biological processes involved in conversion of raw materials into finished food products and how to evaluate those changes.
      iii. Understand the relationship between food and health/wellness.
      iv. Knowledge in the laws and regulations which govern our food supply.
   b. Graduate should be competent in the following core knowledge areas:
      i. Food chemistry and analysis:
         • understand reactions in foods and its components.
• compositions of key foods/products.
• knowledge of analysis methods.

ii Food safety and microbiology:
• knowledge of food pathogens.
• microbiological aspects to making safe foods.
• food preservation methods.

iii Food processing and engineering:
• processing and engineering principles related to foods and their manufacture/design.

iv Food nutrition and health:
• understand the relationships between foods and health/wellness.

v Applied food science:
• integration of disciplines in relation to food problems or processes.
• knowledge of relevant laws and regulations for the food industry.
• current issues/trends in the food industry.

vi Technical and analytical skills:
• able to apply food science and other disciplines to understand real world food industry problems.
• to be able to critically evaluate reports/information relating to food quantitative (mathematical and statistical) analytical skills.

In addition to these departmental program learning outcomes, IFT requires documentation of how students meet a standardized set of Core Competencies.

FOUR-YEAR PLAN

FOUR-YEAR PLAN
SAMPLE FOOD SCIENCE FOUR-YEAR PLAN

Freshman

Fall Credits Spring Credits
CHEM 103 or 109\(^1\) 4-6 CHEM 104\(^1\) 5
MATH 221\(^2\) 5 BIOLOGY/BOTANY/ ZOOLOGY 151 5
General Education course\(^3\) 0-3 General Education Course\(^3\) 0-3
COMM A Course 3 FOOD SCI 201 (recommended) 1
First Year Seminar 1
Total Credits 13-17 11-14

Sophomore

Fall Credits Spring Credits
CHEM 343 3 CHEM 344 & CHEM 345 5
FOOD SCI 301 3 STAT 371 or 301 3

Microbiology 101 & Microbiology 102
Food Science 375 (The Practicing Professional: Pathway to Leadership (recommended))
General Education Course\(^3\) 3
Total Credits 15 13-16

Junior

Fall Credits Spring Credits
BIOCHEM 501 3 NUTR SCI 332 or 510 3
FOOD SCI 440 3 FOOD SCI/AN SCI 321 1
FOOD SCI 410 3 FOOD SCI 432 3
Microbiology/ Food Science 324 & Microbiology/ Food Science 325 5 FOOD SCI 412 4
General Education Courses\(^3\) 0-6 Food Science course\(^4,5\) 0-2
General Education Course\(^3\) 0-6
Total Credits 14-20 11-19

Senior

Fall Credits Spring Credits
FOOD SCI 532 4 FOOD SCI 514 4
FOOD SCI 602 2 FOOD SCI 603\(^6\) 1
Food Science Course\(^4\) 0-3 Food Science Course\(^4\) 0-3
Science Elective Course\(^5\) 0-3 Science Elective Course\(^5\) 0-3
General Education Courses\(^3\) 3-6 General Education Courses\(^3\) 3-6
Total Credits 9-18 8-17

Note: Students must complete two science elective courses: (1) at least 3 credits of any 400-level or above biological science course or BIOLOGY/BOTANY/ZOOLOGY 152 Introductory Biology (2) at least 3 credits of any 400-level or above physical science course.

Combination of FOOD SCI 602 Senior Project and FOOD SCI 603 Senior Seminar satisfy Comm B requirement.

1 Students taking CHEM 109 do not take CHEM 104.
2 MATH 221 will satisfy the Quantitative Reasoning B requirement.
3 Electives can be found on the Requirements tab.
4 Students must select at least one course from FOOD SCI 511 Chemistry and Technology of Dairy Products (spring semester), FOOD SCI/AN SCI 515 Commercial Meat Processing (fall semester), FOOD SCI 535 Confectionery Science and Technology (fall semester), or FOOD SCI 550 Fermented Foods and Beverages (spring semester) and either FOOD SCI 551 Food Fermentation Laboratory (spring semester) or FOOD SCI 375 Special Topics (fall semester).
5 Students must complete two science elective courses: (1) at least 3 credits of any 400-level or above biological science course or BIOLOGY/BOTANY/ZOOLOGY 152 Introductory Biology (2) at least 3 credits of any 400-level or above physical science course.
6 Combination of FOOD SCI 602 Senior Project and FOOD SCI 603 Senior Seminar satisfy Comm B requirement.

Note: Students must complete a minimum of 120 credits. This may require taking 16 credits per semester for at least four semesters.
ADVISING AND CAREERS

Students are assigned a faculty or staff advisor once they declare the major. Advisors are prepared to help with curricular planning and course access; major and degree questions; discussion of independent study and lab research experience; and navigating internship and scholarship opportunities. Declared food science majors must meet with their assigned advisor prior to registration. Additional information can be found on the department’s website (https://foodsci.wisc.edu/advising.php).

Prospective food science majors should contact the Department of Food Science at foodsci@wisc.edu or 608-262-3046 for more information.

PEOPLE

PROFESSORS
Damodaran, Etzel, Hartel, Ingham, Lucey, Parkin, Rankin (chair), Steele

ASSISTANT PROFESSORS
Bolling, Ikeda, vanPijkeren