Food science is a multidisciplinary subject that includes the knowledge applied during the transformation of raw agricultural products into safe, nutritious, and appealing foods. Students receive a broad background in food chemistry, food biochemistry, food microbiology, food engineering, and food processing and in-depth training in one of several areas of emphasis including chemistry, biochemistry, fermentation, microbiology, and sensory science. The program is designed to accommodate both students with food science degrees and those with little or no food science background who have a bachelor’s degree or a strong background in the physical or biological sciences or engineering. There is a strong demand for individuals with the M.S. and Ph.D. in food science from governmental agencies and industrial organizations. Students with the Ph.D. in food science are also in demand by academic institutions. The food science graduate program at UC Davis is recognized as being among the strongest in the world.

At UC Davis, graduate training in many fields is offered by “graduate groups” rather than by departments. These interdepartmental graduate groups are composed of faculty who share common research interests, either in terms of scientific discipline or area of application. Because the research interests circumscribed by one group often overlap with the interests of other groups, it is common for individual faculty to belong to more than one group. For example, a food microbiologist typically belongs to both the Food Science Graduate Group and the Microbiology Graduate Group. Both food science and microbiology graduate students can work in the faculty’s laboratory. However, the two students would have very different coursework, as one would be following the food science curriculum and the other the microbiology curriculum. The major advantages for students of the graduate group system are that they have a much broader range of faculty from which to choose their major professors, as well as chances to interact with students from other graduate groups.

The Food Science M.S. and Ph.D. Degrees

Over 50 faculty members belong to the Graduate Group in Food Science. Most are in the Department of Food Science and Technology and the Department of Viticulture and Enology, but the following departments are also represented among the Food Science Graduate Group faculty: animal sciences; chemistry; biological and agricultural engineering; chemical engineering and material sciences; environmental toxicology; veterinary medicine; microbiology; neurobiology, physiology and behavior; pomology; vegetable crops; and nutrition.

The degree program is designed for students interested in the application of the principles of the biological, chemical, physical, microbiological, toxicological, and behavioral sciences and engineering to the processing, functional analysis, preservation, quality evaluation, public health aspects, and utilization of foods, food components,
and beverages. Among the many areas of research are chemistry of muscle proteins and postmortem breakdown of meat proteins; chemistry of flavors and aromas of foods and alcoholic beverages; structure/function studies of natural and genetically engineered food proteins; surfactant solutions and emulsions; chemistry and biochemistry of lipids; chemistry and action of carcinogens, mutagens, and environmental contaminants found in foods; edible films and coatings to control mass transfer; food rheology; process control; genetic engineering of microbes important in food processing; freezing processes and frozen storage of foods; malting and brewing flavor chemistry; beer foam; sensory evaluation of foods and beverages; food and beverage composition and storage changes; microbiology of wine and other alcoholic beverages; chemistry of phenolic compounds; use of LC/MS to identify bioactive food components; and mechanisms of action of food-borne pathogens.

Students must adhere to deadlines and rules outlined in the current issue of the UC Davis General Catalog. The catalogue is available on-line at http://registrar.ucdavis.edu/UCDWebCatalog/. A bound copy may be purchased from the UC Davis bookstore on-site or by mail with a check made payable to the UCD Bookstore ($10.00 for shipment within the continental U.S., $25.00 for shipment outside the U.S.). This catalog contains information about academic requirements, admission requirements, curricula, course descriptions, degrees offered, regulations, student activities, and general campus information. Information is also available on the web pages for UC Davis (http://www.ucdavis.edu) and the Food Science Graduate Group (http://www-foodsci.ucdavis.edu/GraduateGroup/GradGrpIndex.HTML).

1. ADMISSION AND ADVISING PROCEDURES

The deadline for admission to the Food Science Graduate Group is January 15th. An application for admission may be obtained from Graduate Studies or from the Chair of the Graduate Group in Food Science, University of California, Davis, One Shields Avenue, California 95616. Completed applications should be returned to the Graduate Group in Food Science. Application for admission may be submitted electronically; instructions and on-line application are found at http://gradstudies.ucdavis.edu/prospective/application.html. Students may take the GRE via computer-based testing or paper-based testing (not available in the US). For computer-based testing dates, call 1-800-GRE-CALL. Students must take the GRE by the November deadline in order that their scores make the January 15 deadline. Information about fellowships for new students and application forms are available at http://www.gradstudies.ucdavis.edu/prospective/applicationlanding.html. The printed and completed forms should be mailed to the Graduate Group in Food Science. The applications for fellowships and scholarships cannot be submitted electronically.

The dean of Graduate Studies is responsible for admitting students. All inquiries concerning the status of applications for admission should be referred to the graduate staff advisor of the group.

The primary requirement for admission is evidence of intellectual achievement and potential for successful graduate study. Applicants should hold a bachelor’s
degree, or its equivalent, in a physical or biological science or in engineering from an
institution of acceptable standing. Grade point average should be equivalent to “B” or
better. Specific course work requirements are listed in Section 2. The Graduate Record
Examination (GRE) and at least three letters of recommendation are required.

Applicants whose native language is not English must submit results from a
TOEFL examination. The minimum score required is 550 on the paper-based exam; a
computer-based test is also available (minimum score 213). In addition, an English
entrance examination will be given to foreign students one week before the academic
quarter begins. Students scoring low will be required to take a 5 unit course in English
for one or two quarters.

Academic advisors will be assigned to incoming students before their arrival. An
academic advisor assists in formulating programs that meet the individual’s
educational objectives and assures that the formal requirements for the M.S. or Ph.D.
degree are fulfilled. For Ph.D. students the academic advisor will also assist in assuring
that the student is adequately prepared for the qualifying examination. In addition, the
advisor will serve as an administrative facilitator on issues concerning advancement to
candidacy. The academic advisor is distinct from the student’s major professor in
whose laboratory the M.S. or Ph.D. research is conducted. After the student has chosen
a major professor, this person will assist the advisor. All graduate students should
consult with the academic advisor before enrolling in classes each quarter.

2. PREVIOUS ACADEMIC PREPARATION

M.S. Program

Background Classes: The coursework outlined below constitutes the essential
background for the M.S. degree in food science. Students with background deficiencies
are encouraged to take as many of these courses as possible prior to their admission to
the program. Prospective students, especially those coming from non-food science
programs, are not expected to have taken all the following classes prior to admission.
The equivalent UC Davis courses are noted in parenthesis.

Chemistry: general chemistry lectures and laboratory, including quantitative analysis
(CHE 2A, 2B, 2C); organic chemistry lectures with laboratory (CHE 8A, 8B); physical
chemistry (CHE 107A, 107B).

Biochemistry: general biochemistry lectures (BIS 102, 103); biochemistry laboratory (MCB
120L or FST 123L).

Mathematics: analytical geometry and calculus (MAT 16A, 16B, 16C); statistics including
analysis of variance (AMR 120).

Physics: one year of physics including laboratory (PHY 7A, 7B, 7C).

Microbiology: introductory microbiology (BIS 1A or MIC 102).

Nutrition: nutrition lectures (preferably human) (FST 10 or NUT 111AV).

A foreign language is not required.
Ph.D. Program

Background Classes: The coursework outlined below constitutes the essential background for a Ph.D. degree in food science. Students with background deficiencies are encouraged to take as many of these courses as possible prior to their admission to the program. Prospective students, especially those coming from non-food science programs, are not expected to have taken all the following classes prior to admission. These classes can be taken at UC Davis before the core courses or concurrently. The equivalent UC Davis courses are noted in parenthesis.

Chemistry: general chemistry lectures and laboratory, including quantitative analysis (CHE 2A, 2B, 2C); organic chemistry lectures with laboratory (CHE 118A, 118B, 118C); physical chemistry (CHE 107A, 107B).

Biochemistry: general biochemistry lectures (BIS 102, 103); biochemistry laboratory (MCB 120L or FST 123L).

Mathematics: analytical geometry and calculus (MAT 16A, 16B, 16C); statistics including analysis of variance (AMR 120).

Physics: one year of physics including laboratory (PHY 7A, 7B, 7C).

Microbiology: introductory microbiology (BIS 1A or MIC 102).

Nutrition: nutrition lectures (preferably human) (FST 10 or NUT 111AV).

Food Process Engineering: physical principles in food processing (FST 110A)

Food Chemistry: principles of food composition and properties (FST 100A)

Food Microbiology: food microbiology lectures (FST 104); food microbiology laboratory (FST 104L).

A foreign language is not required.

[Abbreviations used: AMR, Agricultural Management and Range Resources; BIS, Biological Sciences; CHE, Chemistry; EBS, Engineering Biological Systems; ECH, Engineering: Chemical Engineering and Materials Science; FST, Food Science and Technology; MAT, Mathematics; MCB, Molecular and Cellular Biology; MIC, Microbiology; NUT, Nutrition; PHY, Physics; VEN, Viticulture and Enology.]

3. REQUIREMENTS FOR THE M.S. DEGREE

Students will select a specific area of emphasis within food science and choose whether to complete degree requirements under Plan I (with thesis) or Plan II (by oral examination). The coursework required depends on these choices, although some courses are required for all students. The emphasis areas are Chemistry/Biochemistry, Microbiology, Processing, and Sensory Science. A student can also design an individual emphasis area in consultation with the graduate advisor.

A. Core Courses

All students in the program must take (or have taken) the following core courses in food chemistry, food microbiology, and food processing:
Core Courses

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<tr>
<th>Course</th>
<th>Quarter</th>
<th>Title</th>
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<tbody>
<tr>
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<td>I</td>
<td>Food Chemistry and Biochemistry</td>
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<tr>
<td>FST 203</td>
<td>II</td>
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</tr>
<tr>
<td>FST 204</td>
<td>III</td>
<td>Advanced Food Microbiology</td>
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B. Area of Emphasis Courses

To satisfy the requirements of the selected emphasis areas, students must take (or have taken) at least 16 units of specialized courses approved by their advisor. These units must include the courses indicated below and cannot include core courses.

Chemistry/Biochemistry: FST 210 and FST 202 or 211
Microbiology: MIC 140, MIC 150 and FST 205
Processing: Two of the following: EBS 231, EBS 233, EBS 235, EBS 237, EBS 239, EBS 265, EBS 275, ECH 170, ECH 265.
Sensory Science: FST 107, FST 127 and FST 217 or FST 227.

Individual Study: Students interested in designing an individual program should plan coursework equivalent in rigor to the requirements listed under the other emphasis areas. In addition, the completely planned program must be approved by the Student Welfare and Advising Committee and the Executive Committee of the Graduate Group in Food Science.

Core courses and courses chosen to satisfy area of emphasis requirements may 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 16 units requires the approval of the Executive Committee of the Graduate Group in Food Science.

C. Plan I and Plan II Requirements

Plan I (Thesis) requires completion of a minimum of 30 units of upper division (100 series) and graduate (200 series) courses and a thesis based on original research approved by a thesis committee. Of the 30 units, at least 12 units must be in graduate courses in the major field, including a minimum of 3 units of graduate courses other than research and seminar.

The Plan I thesis committee consists of the major professor and two other faculty competent to provide research guidance in the scientific area of the thesis topic. The committee is nominated by the academic advisor and appointed by the dean of Graduate Studies. Plan I students should identify their major professor and establish their thesis topic by their third quarter of graduate study; the composition of the thesis committee should be discussed with their academic advisor soon thereafter.

Plan II (Oral Examination) requires completion of a minimum of 36 units of upper division and graduate courses and, in lieu of the thesis, a research report and a comprehensive oral examination. Of the 36 units, at least 18 units must be in graduate
courses in the major field, including a minimum of 9 units of graduate courses other than research or seminar.

The Plan II orals committee consists of four faculty who are chosen to represent at least three emphasis areas. The major professor cannot be a member of the orals committee. The committee members are nominated by the graduate advisor and appointed by the dean of Graduate Studies. Plan II students should identify their major professor by their third quarter of graduate study and discuss the composition of the orals committee with the academic advisor before the research project is completed.

The research report differs from the thesis in terms of research depth. Whereas, the thesis demonstrates proficiency in completion of a scientific investigation, a research report demonstrates proficiency in the execution of meaningful scientific experiments and in the written presentation of the results. In both cases, the major professor must approve the written document before the degree can be awarded.

The unit requirements for both Plan I and Plan II are the minimum requirements. To achieve the best possible education, students are strongly encouraged to take additional depth coursework as determined through consultation with both the major professor and academic advisor.

D. Seminar Requirement

All students must take 3 units of graduate seminar and give at least one oral presentation of research results. Two units must be selected from FST 290, FST 291, and VEN 290. The third unit of seminar is chosen with consent of the graduate advisor. Credit for the oral presentation may be earned by completion of FST 291. Students who do not take FST 291 must present a seminar based on their thesis or research project.

4. REQUIREMENTS FOR THE PH.D. DEGREE

Students will select a specific area of emphasis within food science and complete degree requirements by writing a thesis. The coursework required depends on these choices, although some courses are required for all students. The emphasis areas are Chemistry/Biochemistry, Microbiology/Fermentation and Sensory Science.

All students develop a broad background in food biochemistry, chemistry, processing and microbiology through the core courses. In addition, each student takes sufficient advanced coursework in their area of emphasis, designed to build upon their undergraduate degree, so that they can develop a specialized advanced knowledge base. Students are encouraged to take additional courses throughout their residence. The academic advisor, with the assistance of the major professor, will help each student form his or her course plan. Sufficient research (299) units must also be taken so that an acceptable dissertation can be written.
A. Core Courses

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</table>

B. Area of Emphasis Courses

Chemistry /Biochemistry, Microbiology/Fermentation: These Areas of Emphasis will include at least 15 units of graduate courses (not including variable unit courses or seminars). Six units should be graduate courses focusing primarily on foods/beverages; core courses do not count towards this requirement. Nine units should be appropriate graduate courses from a basic scientific discipline. Graduate courses from Chemistry, Molecular and Cellular Biology, Microbiology, Nutrition, Physiology, and Statistics Sections are appropriate to fulfill this requirement. The selection of these and other courses for the area of emphasis will be made in order to provide the student with a set of focused courses within their area.

Sensory Science: The following courses will be required for the Sensory Science emphasis (in addition to the core courses, variable unit courses and seminars): FST 107, FST 217, FST 227 and FST 207 or VEN 225, one graduate course in physiology or nutrition (3/4 units), one graduate course in statistics (3/4 units), and one course in psychology (3/4 units, upper division or graduate, excluding statistics courses). The academic advisor should be consulted for a list of appropriate courses.

Core courses and courses chosen to satisfy area of emphasis requirements may 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 16 units requires the approval of the Executive Committee of the Graduate Group in Food Science.

C. Qualifying Oral Examination

The qualifying examination is an oral examination that will be administered by a committee of 5 members, recommended by the Executive Committee and appointed by Graduate Studies. In consultation with their academic advisor and major professor, students must submit an application for examination. With that application, students are encouraged to suggest a committee that would include their anticipated dissertation committee members—except their major professor who shall not be a member of the qualifying examination. The committee chair must be an Academic Senate faculty member of the Food Science Graduate Group. At least one member will be an Academic Senate member who is not a member of the group, but has expertise in the student's area of emphasis. The committee cannot have more than one member who is not an active member of the Academic Senate, i.e., emeriti or C.E. specialists. There will be one member each from the core areas of food chemistry/biochemistry, food microbiology and food processing. If the membership changes within one month of the
examination date, the student can have the examination rescheduled. Scheduling will
be handled by the graduate group secretary. The qualifying examination is taken soon
after completion of the course plan, which would normally be at the end of the second
year in residence. The examination will consist of two parts. For the first part, students
are required to present and defend their thesis research proposal, including results and
plans. For the second part, students will be tested on their breadth of knowledge in the
three core areas of food science.

Except for the proposal, the student cannot bring any materials to the examination
without approval by the examination chair. The objective of the qualifying examination
is to assess the student’s general knowledge in the core areas of food science, and their
ability to apply critical reasoning to issues and problems in food science, particularly in
their area of emphasis. However, the committee is charged to explore beyond the
student’s area of specific knowledge in order to ascertain ability to solve problems.
Passing this examination allows a student to file for advancement to Ph.D. candidacy,
assuming the student has met the course and other requirements. Rules for grading this
examination are governed by Davis Graduate Studies rules.

D. Dissertation

Upon advancement to candidacy, the student will then complete the requirements
under Plan B of Davis Graduate Studies by carrying out a research program under the
direction of a major professor, who must be an active member of the Food Science
Graduate Group, and by submitting an acceptable dissertation. The preparation of the
dissertation will be under the guidance of a dissertation committee of three members,
recommended by the Executive Committee and appointed by Graduate Studies.
Students are encouraged to suggest a committee drawn from their oral examination
committee, after consultation with their academic advisor. The major professor will
serve as the chairperson. The candidate will organize annual meetings with the
committee to review the research program, and will provide documentation of the
meeting to the chair of the Graduate Group by October 1 of each year, until the
dissertation has been completed and signed by the committee members. An exit
seminar will be presented before the dissertation is signed.

E. Seminars/Oral Presentations

In order to advance to candidacy, students must also take a minimum of six units
of seminar. Three units can be obtained by taking FST 290 for two quarters and FST 291
once; however, numerous other departments and graduate groups offer suitable
seminar classes. In addition, the student must give at least one oral presentation to
advance to candidacy. FST 291 satisfies this requirement, but other seminar programs
that require a presentation can also satisfy this requirement.

F. Final Examination

None is required, but an exit seminar is required.
5. ADVANCEMENT TO CANDIDACY

Each student must file an application for advancement to candidacy with the dean of Graduate Studies. For M.S. students, this should be done not later than one quarter prior to the anticipated date of completion of the degree. The student should consult with the academic advisor before completing the application. Advancement to candidacy must precede the filing of the M.S. thesis (Plan I) or completion of the M.S. oral examination (Plan II). For Ph.D. students, advancement to candidacy should be done immediately after passing the Ph.D. oral qualifying examination.

6. STANDARDS OF SCHOLARSHIP

A. Grade Point Average:

Each student must maintain a grade point average (GPA) of at least 3.0 (A=4) in all upper division (100 series) and graduate courses (200 series). Only those courses of the 100 and 200 series in which a student receives an S or at least a C- may be counted towards satisfying degree requirements. Grades of D+ or lower cannot be used to satisfy the unit requirement but will be counted in determining the GPA. However, a student may, with the consent of the academic advisor and the dean of Graduate Studies, repeat a course in which the grade of C+ or lower was earned. In such repeated courses, only the most recent grade shall be used in calculating the GPA (although all grades received will be part of the permanent record). No more than 9 units may be repeated, and a course taken for a letter grade cannot be repeated on a Satisfactory/Unsatisfactory (S/U) basis.

Courses in the 300-400 series (professional schools) may be accepted if they have been approved by the Graduate Council. Courses graded S/U, including research (299) and seminar (290), are not included in calculation of the GPA. If the student’s overall GPA is less than 3.0, the student will receive a warning letter from Graduate Studies. If there is little or no improvement in the following quarter, the student is subject to dismissal.

B. Satisfactory/Unsatisfactory (S/U) Grading:

Variable unit courses and certain other specified courses are graded only S/U. Students may also elect to take limited numbers of other courses S/U by obtaining a petition from Graduate Studies and the signature of the academic advisor. Only one optional S/U selection may be taken each quarter. The grade of “S” is awarded in graduate courses only for work which otherwise would receive a grade of B- or better and, in undergraduate courses, only for work which would otherwise receive a grade of C- or better.

7. TIME REQUIREMENTS

M.S. The student must be in residence for at least one year, but ordinarily it will take two years to meet the M.S. requirements. Additional time may be required by students with English language deficiencies, and by those with academic deficiencies.
Ph.D. The student must be in residence for at least two years, but ordinarily it will take five years to meet the Ph.D. requirements.

8. APPLICATION FOR FINANCIAL SUPPORT

Ph.D. students in the Food Science Graduate Group are guaranteed full support through a combination of research assistantships, teaching assistantships and fellowships. The Graduate Group in Food Science also provides non-resident tuition fee waivers to most first year, international and out-of-state domestic students in the doctoral program. A financial package providing initial fellowship, teaching and/or research assistantship support to first-year Ph.D. students will be offered upon admission. The Graduate Group in Food Science provides some initial fellowship, teaching and/or research assistantship support to outstanding first-year M.S. students upon admission. Subsequent financial support will be coordinated through the students' chosen major research professor. Additional teaching assistantships are administered by individual departments and candidates are considered after entrance into the program. UC Davis fellowships, scholarships and various types of financial aid are also available. See web site http://faoman.ucdavis.edu/.

Research Assistantship inquiries can also be directed to individual faculty members. A list of all members of the group with their departmental affiliations and a brief summary of research interests is available in a separate brochure. To obtain this brochure and other information contact Graduate Staff Advisor, Food Science Graduate Group Associate, Department of Food Science and Technology, University of California, One Shields Avenue, Davis CA 95616-8598; 530-752-1466.

April 2003

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