Food Science (FDSC)

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Food science is an interdisciplinary field involving microbiology, engineering, biochemistry, nutrition, and sensory science to better understand food processes and improve food products for the general public. As the stewards of the field, food scientists study the physical, microbial, and chemical makeup of food. They apply their findings to develop the safe, nutritious, and sustainable foods and innovative packaging that line supermarket shelves daily.

Food science prepares students for many interesting, rewarding and challenging professional career opportunities in industry, business, governmental and educational organizations associated with food and food-related products. Due to the diversity and abundance of opportunities available, students graduating with a B.S.A. in food science readily obtain employment in the food industry or continue studies for graduate school. Additionally, requirements for several pre-professional programs can be fulfilled while meeting requirements for the food science degree.

Students may choose one of three areas of concentration for their degree program: Food Science (FDSC), Food Technology (FDTN) or Food and Culinary Sciences (FDCU). The FDSC concentration at the University of Arkansas is one of only 43 programs in the United States and the only one in Arkansas that is approved by the Institute of Food Technologists. It provides students with a strong background in basic and applied sciences and food chemistry, microbiology, engineering and quality control.

The food we consume daily is the result of extensive food research, a systematic investigation into a variety of foods' properties and compositions. After the initial stages of research and development, food products are mass produced using the principles of food technology. The FDTN concentration provides students interested in food industry careers with a multidisciplinary education consisting of core food science requirements in combination with a minor chosen by the student to compliment the student's career goals.

Culinary sciences blend the artistic abilities of culinary arts with the scientific expertise of food science to shape the future of research and development in the food industry. The FDCU concentration provides students interested in product development careers with an interdisciplinary background in food science and culinary arts. This concentration is a partnership program with Northwest Arkansas Community College (NWACC). Students complete their culinary arts coursework at Brightwater: A Center for the Study of Food (an academic division of NWACC located in Bentonville, AR) and are eligible to receive a Certificate of Proficiency in Culinary Arts from NWACC with no additional coursework. Culinary coursework will be transferred to the UA; it can be taken prior to admission to the UA or taken while in residence at the UA. Food and Culinary Sciences concentration will provide students with the course work necessary to be eligible to become a Certified Culinary Scientist through the Research Chef's Association.

Students in each concentration are required to complete a relevant internship. There are also ample opportunities for students to gain research and international experiences and to select a minor.

Requirements for B.S.A. in Food Science with Food Science Concentration

Major Requirements

State minimum core (http://catalog.uark.edu/undergraduatecatalog/gened/stateminimum/) and discipline-specific general education requirements: (Course work that meets state minimum core requirements is in bold.)

Communication (12 hours)		**12**
ENGL 1013	Composition I (ACTS Equivalency = ENGL 1013)	
ENGL 1023	Composition II (ACTS Equivalency = ENGL 1023)	
Select two courses from approved list of communication intensive courses		
U.S. History and Government (3 hours)		**3**
Select 3 hours US History from University Core		
Mathematics and Statistics (6 hours)		**6**
MATH 1203	College Algebra (ACTS Equivalency = MATH 1103)	
STAT 2303	Principles of Statistics (ACTS Equivalency = MATH 2103)	
Physical and Biological Sciences (23-27 hours)		**23-27**
BIOL 1543 & BIOL 1541L	Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)	
BIOL 2013 & BIOL 2011L	General Microbiology (ACTS Equivalency = BIOL 2004 Lecture) and General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)	
CHEM 1103 & CHEM 1101L	University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)	
CHEM 1123 & CHEM 1121L	University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)	
CHEM 3813	Elements of Biochemistry	
CHEM 2613 & CHEM 2611L	Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) and Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)	
or CHEM 36 & CHEM 36 & CHEM 36 & CHEM 36	Organic Chemistry I and Organic Chemistry I Laboratory and Organic Chemistry II and Organic Chemistry II Laboratory	
Fine Arts and Humanities (6 hours)		**6**
Select 3 hours Fine Arts from State Minimum Core		

	Select 3 hours Humanities from State Minimum Core	
Social Sciences (9 hours)		**9**
	Select 9 hours Social Sciences from State Minimum Core	
University Requirement (1 hr)		**1**
UNIV 1001	University Perspectives	
Food Science Degree Requirements (32 hours)		**32**
FDSC 1011	Exploring Topics in Food Science	
FDSC 1103	Introduction to Food Science	
FDSC 2523	Sanitation and Safety in Food Processing Operations	
FDSC 3103	Principles of Food Processing	
FDSC 3202	Introduction to Food Law	
FDSC 4113 & FDSC 4111L	Food Analysis and Food Analysis Lab	
FDSC 4122 & FDSC 4121L	Food Microbiology and Food Microbiology Lab	
FDSC 4304	Food Chemistry	
FDSC 431V	Internship in Food Science	
FDSC 4413	Sensory Evaluation of Food	
FDSC 4713	Product Innovation for the Food Scientist	
21 hours from concentration requirements (FDSC, FDCU, FDTN)		**21**
General Electives		**3-7**
Total Hours		**120**

Additional Requirements for Food Science Concentration (21 hours)		
FDSC 4754	Engineering Principles of Food Processing	4
MATH 1213	Plane Trigonometry (ACTS Equivalency = MATH 1203)	3
MATH 2554	Calculus I (ACTS Equivalency = MATH 2405)	4
NUTR 1213	Fundamentals of Nutrition	3
PHYS 2013 & PHYS 2011L	College Physics I (ACTS Equivalency = PHYS 2014 Lecture) and College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)	4
General Elective		3
Total Hours		**21**

Food Science B.S.A., Food Science Concentration

Nine-Semester Degree Program

Because the Food Science Concentration requires an internship one summer, students cannot enroll in an Eight-Semester Program. See the Eight-Semester Degree Policy (http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/) for requirements of the eight-semester programs.

First Year			**Units**
	Fall	**Spring**	**Summer**
UNIV 1001 University Perspectives	1		
ENGL 1013 Composition I (ACTS Equivalency = ENGL 1013) (Satisfies General Education Outcome 1.1)	3		
MATH 1203 College Algebra (ACTS Equivalency = MATH 1103) (Satisfies General Education Outcome 2.1)	3		
Satisfies General Education Outcome 3.4:			
BIOL 1543 Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) & BIOL 1541L Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)	4		
FDSC 1011 Exploring Topics in Food Science	1		
ENGL 1023 Composition II (ACTS Equivalency = ENGL 1023) (Satisfies General Education Outcome 1.1)		3	
MATH 1213 Plane Trigonometry (ACTS Equivalency = MATH 1203)		3	
Satisfies General Education Outcome 3.4:			
CHEM 1103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 1101L University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)		4	
FDSC 1103 Introduction to Food Science		3	
FDSC 2523 Sanitation and Safety in Food Processing Operations		3	
Year Total:	12	16	

Second Year			**Units**
	Fall	**Spring**	**Summer**
STAT 2303 Principles of Statistics (ACTS Equivalency = MATH 2103)	3		
CHEM 1123 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) & CHEM 1121L University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)	4		
PHYS 2013 College Physics I (ACTS Equivalency = PHYS 2014 Lecture) & PHYS 2011L College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)	4		
NUTR 1213 Fundamentals of Nutrition	3		
General Elective	1		
MATH 2554 Calculus I (ACTS Equivalency = MATH 2405)		4	
BIOL 2013 General Microbiology (ACTS Equivalency = BIOL 2004 Lecture) & BIOL 2011L General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)		4	

CHEM 2613 Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) & CHEM 2611L Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)		4	
General Elective[6]		3	
Year Total:	15	15	

Third Year	Fall	Spring	Summer Units
CHEM 3813 Elements of Biochemistry	3		
FDSC 3103 Principles of Food Processing	3		
FDSC 4304 Food Chemistry	4		
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]	3		
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]	3		
FDSC 3202 Introduction to Food Law		2	
FDSC 4113 Food Analysis & FDSC 4111L Food Analysis Lab		4	
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]		3	
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]		3	
General Elective (odd years)[6]		3	
FDSC 431V Internship in Food Science			3
Year Total:	16	15	3

Fourth Year	Fall	Spring	Summer Units
FDSC 4122 Food Microbiology & FDSC 4121L Food Microbiology Lab	3		
FDSC 4413 Sensory Evaluation of Food	3		
Communication Intensive Course[5]	3		
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]	3		
General Elective[6]	3		
FDSC 4713 Product Innovation for the Food Scientist (Satisfies General Education Outcome 6.1)		3	
FDSC 4754 Engineering Principles of Food Processing (even years)		4	
Communication Intensive Course[5]		3	
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]		3	
Year Total:	15	13	

Total Units in Sequence:	**120**

1 The Fine Arts Elective courses which satisfy General Education Outcome 3.1 include: ARCH 1003, ARHS 1003, COMM 1003, DANC 1003, LARC 1003, MLIT 1003, MLIT 1003H, MLIT 1013, MLIT 1013H, MLIT 1333, THTR 1003, THTR 1013, or THTR 1013H.

2 The Humanities Elective courses which satisfy General Education Outcomes 3.2 and 5.1 include: CLST 1003, CLST 1003H, CLST 1013, HUMN 1124H, PHIL 2003, PHIL 2003C, PHIL 2003H, PHIL 2103, or PHIL 2103C.

3 One Social Science Elective should be selected from the following list of courses in order to satisfy General Education Outcomes 3.3 and 4.1: ANTH 1023, COMM 1023, HDFS 1403, HDFS 2413, HIST 1113, HIST 1113H, HIST 1123, HIST 1123H, HIST 2093, HUMN 1114H, HUMN 2114H, INST 2013, INST 2813, INST 2813H, PLSC 2013, PLSC 2813, PLSC 2813H, RESM 2853, SOCI 2013, SOCI 2013H, or SOCI 2033.

4 The U.S. History or Government Elective courses which satisfy General Education Outcome 4.2 include: HIST 2003, HIST 2013, or PLSC 2003.

5 Recommend ACOM 3143, AGED 4003 or COMM 1313 to satisfy General Education Outcome 1.2. See academic adviser for complete list of Communication Intensive courses.

6 Students must complete 40 hours of upper division courses (3000-4000 level). It is recommended that students consult with the academic adviser when making course selections.

Requirements for B.S.A. in Food Science with Food Technology Concentration

Major Requirements

State minimum core (http://catalog.uark.edu/undergraduatecatalog/gened/stateminimum/) and discipline-specific general education requirements: (Course work that meets state minimum core requirements is in bold.)

Communication (12 hours)		**12**
ENGL 1013	Composition I (ACTS Equivalency = ENGL 1013)	
ENGL 1023	Composition II (ACTS Equivalency = ENGL 1023)	
Select two courses from approved list of communication intensive courses		
U.S. History and Government (3 hours)		**3**
Select 3 hours US History from University Core		
Mathematics and Statistics (6 hours)		**6**
MATH 1203	College Algebra (ACTS Equivalency = MATH 1103)	
STAT 2303	Principles of Statistics (ACTS Equivalency = MATH 2103)	
Physical and Biological Sciences (23-27 hours)		**23-27**
BIOL 1543 & BIOL 1541L	Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)	
BIOL 2013 & BIOL 2011L	General Microbiology (ACTS Equivalency = BIOL 2004 Lecture) and General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)	

CHEM 1103 & CHEM 1101L	University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)	
CHEM 1123 & CHEM 1121L	University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)	
CHEM 3813	Elements of Biochemistry	
CHEM 2613 & CHEM 2611L	Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) and Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)	
or CHEM 36(& CHEM 36(& CHEM 361 & CHEM 361	Organic Chemistry I and Organic Chemistry I Laboratory and Organic Chemistry II and Organic Chemistry II Laboratory	
Fine Arts and Humanities (6 hours)		**6**
Select 3 hours Fine Arts from State Minimum Core		
Select 3 hours Humanities from State Minimum Core		
Social Sciences (9 hours)		**9**
Select 9 hours Social Sciences from State Minimum Core		
University Requirement (1 hr)		**1**
UNIV 1001	University Perspectives	
Food Science Degree Requirements (32 hours)		**32**
FDSC 1011	Exploring Topics in Food Science	
FDSC 1103	Introduction to Food Science	
FDSC 2523	Sanitation and Safety in Food Processing Operations	
FDSC 3103	Principles of Food Processing	
FDSC 3202	Introduction to Food Law	
FDSC 4113 & FDSC 4111L	Food Analysis and Food Analysis Lab	
FDSC 4122 & FDSC 4121L	Food Microbiology and Food Microbiology Lab	
FDSC 4304	Food Chemistry	
FDSC 431V	Internship in Food Science	
FDSC 4413	Sensory Evaluation of Food	
FDSC 4713	Product Innovation for the Food Scientist	
21 hours from concentration requirements (FDSC, FDCU, FDTN)		**21**
General Electives		**3-7**
Total Hours		**120**

Additional Requirements for Food Technology Concentration (21 hours)		
MATH 2043	Survey of Calculus (ACTS Equivalency = MATH 2203)	3
Completion of a minor to provide multidisciplinary educational background [1]		15
General Elective		3
Total Hours		**21**

[1] Students must declare chosen minor with the Bumpers College Dean's Office. Visit the list of Bumpers College minors (http://catalog.uark.edu/undergraduatecatalog/collegesandschools/dalebumperscollegeofagriculturalfoodandlifesciences/#fieldsofstudytext).

Food Science B.S.A., Food Technology Concentration
Nine-Semester Degree Program

Because the Food Technology Concentration requires an internship one summer, students cannot enroll in an Eight-Semester Program. See the Eight-Semester Degree Policy (http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/) for requirements of the eight-semester programs. Students in the Food Technology Concentration must also complete a minor to provide multidisciplinary educational background (minor must be declared with Bumpers College Dean's Office). Where not specified, select courses from the state minimum core (http://catalog.uark.edu/undergraduatecatalog/gened/stateminimum/) list.

First Year			Units
	Fall	Spring	Summer
UNIV 1001 University Perspectives	1		
ENGL 1013 Composition I (ACTS Equivalency = ENGL 1013) (Satisfies General Education Outcome 1.1)	3		
MATH 1203 College Algebra (ACTS Equivalency = MATH 1103) (Satisfies General Education Outcome 2.1)	3		
Satisfies General Education Outcome 3.4:			
BIOL 1543 Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) & BIOL 1541L Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)	4		
FDSC 1011 Exploring Topics in Food Science	1		
ENGL 1023 Composition II (ACTS Equivalency = ENGL 1023) (Satisfies General Education Outcome 1.1)		3	
Satisfies General Education Outcome 3.4:			
CHEM 1103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 1101L University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)		4	
FDSC 1103 Introduction to Food Science		3	
FDSC 2523 Sanitation and Safety in Food Processing Operations		3	
Course required for selected minor		3	
Year Total:	12	16	

Second Year			Units
	Fall	Spring	Summer
MATH 2043 Survey of Calculus (ACTS Equivalency = MATH 2203)	3		

CHEM 1123 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) & CHEM 1121L University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)	4		
Course required for selected minor	3		
Course required for selected minor	3		
General Elective	3		
STAT 2303 Principles of Statistics (ACTS Equivalency = MATH 2103)		3	
BIOL 2013 General Microbiology (ACTS Equivalency = BIOL 2004 Lecture) & BIOL 2011L General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)		4	
CHEM 2613 Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) & CHEM 2611L Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)		4	
Course required for selected minor		3	
General Elective		1	
Year Total:	16	15	

Third Year			**Units**
	Fall	**Spring**	**Summer**
CHEM 3813 Elements of Biochemistry	3		
FDSC 3103 Principles of Food Processing	3		
FDSC 4304 Food Chemistry	4		
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]	3		
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]	3		
FDSC 3202 Introduction to Food Law		2	
FDSC 4113 Food Analysis & FDSC 4111L Food Analysis Lab		4	
Course required for selected minor		3	
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]		3	
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]		3	
FDSC 431V Internship in Food Science			3
Year Total:	16	15	3

Fourth Year			**Units**
	Fall	**Spring**	**Summer**
FDSC 4122 Food Microbiology & FDSC 4121L Food Microbiology Lab	3		
FDSC 4413 Sensory Evaluation of Food	3		
Communication Intensive Course[5, 6]	3		
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]	3		
General Elective[6]	3		
FDSC 4713 Product Innovation for the Food Scientist (Satisfies General Education Outcome 6.1)		3	
Communication Intensive Course[5, 6]		3	
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[1, 2, 3, 4]		3	
General Electives[6]		3	
Year Total:	15	12	

Total Units in Sequence: 120

1 The Fine Arts Elective courses which satisfy General Education Outcome 3.1 include: ARCH 1003, ARHS 1003, COMM 1003, DANC 1003, LARC 1003, MLIT 1003, MLIT 1003H, MLIT 1013, MLIT 1013H, MLIT 1333, THTR 1003, THTR 1013, or THTR 1013H.

2 The Humanities Elective courses which satisfy General Education Outcomes 3.2 and 5.1 include: CLST 1003, CLST 1003H, CLST 1013, HUMN 1124H, PHIL 2003, PHIL 2003C, PHIL 2003H, PHIL 2103, or PHIL 2103C.

3 One Social Science Elective should be selected from the following list of courses in order to satisfy General Education Outcomes 3.3 and 4.1: ANTH 1023, COMM 1023, HDFS 1403, HDFS 2413, HIST 1113, HIST 1113H, HIST 1123, HIST 1123H, HIST 2093, HUMN 1114H, HUMN 2114H, INST 2013, INST 2813, INST 2813H, PLSC 2013, PLSC 2813, PLSC 2813H, RESM 2853, SOCI 2013, SOCI 2013H, or SOCI 2033.

4 The U.S. History or Government Elective courses which satisfy General Education Outcome 4.2 include: HIST 2003, HIST 2013, or PLSC 2003.

5 Recommend ACOM 3143, ACOM 3143H, AGED 4003 or COMM 1313 to satisfy General Education Outcome 1.2. See academic adviser for complete list of Communication Intensive courses.

6 Students must complete 40 hours of upper division courses (3000-4000 level). It is recommended that students consult with the academic adviser when making course selections.

Requirements for B.S.A. in Food Science with Food and Culinary Sciences Concentration

Major Requirements

State minimum core (http://catalog.uark.edu/undergraduatecatalog/gened/stateminimum/) and discipline-specific general education requirements: (Course work that meets state minimum core requirements is in bold.)

Communication (12 hours)		**12**
ENGL 1013	Composition I (ACTS Equivalency = ENGL 1013)	
ENGL 1023	Composition II (ACTS Equivalency = ENGL 1023)	
Select two courses from approved list of communication intensive courses		
U.S. History and Government (3 hours)		**3**
Select 3 hours US History from University Core		

Mathematics and Statistics (6 hours)		**6**
MATH 1203	College Algebra (ACTS Equivalency = MATH 1103)	
STAT 2303	Principles of Statistics (ACTS Equivalency = MATH 2103)	
Physical and Biological Sciences (23-27 hours)		**23-27**
BIOL 1543 & BIOL 1541L	Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)	
BIOL 2013 & BIOL 2011L	General Microbiology (ACTS Equivalency = BIOL 2004 Lecture) and General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)	
CHEM 1103 & CHEM 1101L	University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)	
CHEM 1123 & CHEM 1121L	University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)	
CHEM 3813	Elements of Biochemistry	
CHEM 2613 & CHEM 2611L	Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) and Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)	
or CHEM 36(& CHEM 36(& CHEM 361 & CHEM 361	Organic Chemistry I and Organic Chemistry I Laboratory and Organic Chemistry II and Organic Chemistry II Laboratory	
Fine Arts and Humanities (6 hours)		**6**
Select 3 hours Fine Arts from State Minimum Core		
Select 3 hours Humanities from State Minimum Core		
Social Sciences (9 hours)		**9**
Select 9 hours Social Sciences from State Minimum Core		
University Requirement (1 hr)		**1**
UNIV 1001	University Perspectives	
Food Science Degree Requirements (32 hours)		**32**
FDSC 1011	Exploring Topics in Food Science	
FDSC 1103	Introduction to Food Science	
FDSC 2523	Sanitation and Safety in Food Processing Operations	
FDSC 3103	Principles of Food Processing	
FDSC 3202	Introduction to Food Law	
FDSC 4113 & FDSC 4111L	Food Analysis and Food Analysis Lab	
FDSC 4122 & FDSC 4121L	Food Microbiology and Food Microbiology Lab	
FDSC 4304	Food Chemistry	
FDSC 431V	Internship in Food Science	
FDSC 4413	Sensory Evaluation of Food	
FDSC 4713	Product Innovation for the Food Scientist	
21 hours from concentration requirements (FDSC, FDCU, FDTN)		**21**
General Electives		**3-7**
Total Hours		**120**

Additional Requirements for Food and Culinary Sciences Concentration (21 hours)		
FDST 1023 Foundations [1]		3
FDST 1033 Sauces [1]		3
FDST 1043 Methods [1]		3
FDST 1203 Baking [1]		3
FDST 1403 Butchery & Charcuterie [1]		3
FDST 2003 World Cuisine [1]		3
MATH 2043	Survey of Calculus (ACTS Equivalency = MATH 2203)	3
Total Hours		**21**

[1] Indicates NorthWest Arkansas Community College course codes.

Food Science B.S.A., Food and Culinary Sciences Concentration Nine-Semester Degree Program

Because the Food and Culinary Sciences Concentration requires an internship one summer, students cannot enroll in an Eight-Semester Program. See the Eight-Semester Degree Policy (http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/) for requirements of the eight-semester programs.

First Year			**Units**
	Fall	**Spring**	**Summer**
UNIV 1001 University Perspectives	1		
ENGL 1013 Composition I (ACTS Equivalency = ENGL 1013) (Satisfies General Education Outcome 1.1)	3		
MATH 1203 College Algebra (ACTS Equivalency = MATH 1103) (Satisfies General Education Outcome 2.1)	3		
Satisfies General Education Outcome 3.4:			
BIOL 1543 Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) & BIOL 1541L Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)	4		
FDSC 1011 Exploring Topics in Food Science	1		
ENGL 1023 Composition II (ACTS Equivalency = ENGL 1023) (Satisfies General Education Outcome 1.1)		3	
Satisfies General Education Outcome 3.4:			
CHEM 1103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 1101L University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)		4	

FDSC 1103 Introduction to Food Science		3	
FDSC 2523 Sanitation and Safety in Food Processing Operations		3	
FDST 1023 Foundations[1]		3	
Year Total:	12	16	

Second Year			Units
	Fall	Spring	Summer
MATH 2043 Survey of Calculus (ACTS Equivalency = MATH 2203)	3		
CHEM 1123 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) & CHEM 1121L University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)	4		
FDST 1033 Sauces[1]	3		
FDST 1043 Methods[1]	3		
FDST 1203 Baking[1]	3		
STAT 2303 Principles of Statistics (ACTS Equivalency = MATH 2103)		3	
BIOL 2013 General Microbiology (ACTS Equivalency = BIOL 2004 Lecture) & BIOL 2011L General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)		4	
CHEM 2613 Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) & CHEM 2611L Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)		4	
FDST 1403 Butchery & Charcuterie[1]		3	
General Elective		1	
Year Total:	16	15	

Third Year			Units
	Fall	Spring	Summer
CHEM 3813 Elements of Biochemistry	3		
FDSC 3103 Principles of Food Processing	3		
FDSC 4304 Food Chemistry	4		
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[2, 3, 4, 5]	3		
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[2, 3, 4, 5]	3		
FDSC 3202 Introduction to Food Law		2	
FDSC 4113 Food Analysis & FDSC 4111L Food Analysis Lab		4	
FDST 2003 World Cuisine[1]		3	
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[2, 3, 4, 5]		3	
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[2, 3, 4, 5]		3	
FDSC 431V Internship in Food Science			3
Year Total:	16	15	3

Fourth Year			Units
	Fall	Spring	Summer
FDSC 4122 Food Microbiology & FDSC 4121L Food Microbiology Lab	3		
FDSC 4413 Sensory Evaluation of Food	3		
Communication Intensive Course[6]	3		
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[2, 3, 4, 5]	3		
General Elective [7]	3		
FDSC 4713 Product Innovation for the Food Scientist (Satisfies General Education Outcome 6.1)		3	
Communication Intensive Course[6]		3	
State Minimum Core in Fine Arts; Humanities; Social Science; or U.S. History or Government[2, 3, 4, 5]		3	
General Elective [7]		3	
Year Total:	15	12	

Total Units in Sequence:	**120**

1 Indicates NorthWest Arkansas Community College course codes.

2 The Fine Arts Elective courses which satisfy General Education Outcome 3.1 include: ARCH 1003, ARHS 1003, COMM 1003, DANC 1003, LARC 1003, MLIT 1003, MLIT 1003H, MLIT 1013, MLIT 1013H, MLIT 1333, THTR 1003, THTR 1013, or THTR 1013H.

3 The Humanities Elective courses which satisfy General Education Outcomes 3.2 and 5.1 include: CLST 1003, CLST 1003H, CLST 1013, HUMN 1124H, PHIL 2003, PHIL 2003C, PHIL 2003H, PHIL 2103, or PHIL 2103C.

4 One Social Science Elective should be selected from the following list of courses in order to satisfy General Education Outcomes 3.3 and 4.1: ANTH 1023, COMM 1023, HDFS 1403, HDFS 2413, HIST 1113, HIST 1113H, HIST 1123, HIST 1123H, HIST 2093, HUMN 1114H, HUMN 2114H, INST 2013, INST 2813, INST 2813H, PLSC 2013, PLSC 2813, PLSC 2813H, RESM 2853, SOCI 2013, SOCI 2013H, or SOCI 2033.

5 The U.S. History or Government Elective courses which satisfy General Education Outcome 4.2 include: HIST 2003, HIST 2013, or PLSC 2003.

6 Recommend ACOM 3143, AGED 4003 or COMM 1313 to satisfy General Education Outcome 1.2. See academic adviser for complete list of Communication Intensive courses.

7 Students must complete 40 hours of upper division courses (3000-4000 level). It is recommended that students consult with the academic adviser when making course selections.

test

Minor in Food Science (FDSC-M)

The Food Science Minor consists of 18 semester hours to include:

The following courses are required for a minor in Food Science:

FDSC 3103	Principles of Food Processing	3
FDSC 4122 & FDSC 4121L	Food Microbiology and Food Microbiology Lab	3
FDSC 4304	Food Chemistry	4
and a minimum of 8 hours selected from the following courses (at least 5 hours must be 3000-4000 level coursework):		8
FDSC 1103	Introduction to Food Science	
FDSC 2401	Uncorked: Vines to Wines	
FDSC 2401H	Honors Uncorked: Vines to Wines	
FDSC 2603	The Science of Cooking	
FDSC 2701	Food for Health	
FDSC 3202	Introduction to Food Law	
FDSC 4113 & FDSC 4111L	Food Analysis and Food Analysis Lab	
FDSC 4413	Sensory Evaluation of Food	
FDSC 4754	Engineering Principles of Food Processing	
NUTR 4213	Advanced Nutrition I	
Total Hours		**18**

A student planning to minor in food science must consult a Department of Food Science adviser.

Requirements for Certificate of Proficiency in Brewing Science

This program is designed to provide students with a theoretical and practical introduction to brewing and fermentation. This certificate requires 15 credit hours of work, selected from the list below. Students must take two courses in brewing, one lecture and one lab, complete three credit hours of an internship, research, or special problems course, and then take two additional courses in FDSC, BIOL, CHEM, BENG, or CHEG. To broaden the student's exposure to the skills needed in brewing and fermentation, for currently enrolled undergraduate students, at least one of these additional courses must be in a different department from the department of the student's major, and that course must also be outside of those already required for the student's major(s). If the student already holds a degree, the course must be a new one outside of the previous degree program.

Required courses		
FDSC 2723	Introduction to Brewing Science	3
BIOL 2723L		3
Required internship, special problems, or honors research project		**3**
Internship		
Students could participate in an approved three credit hour internship with a brewing industry partner. A three credit hour internship should involve approximately 120-130 hours of work with the partner. The internship need not be completed in a single semester, although that is acceptable. At the end of the final semester of the internship, students would have to present a written and oral report of the work performed and lessons learned.		
Special problems or research hours		
Students could complete three credit hours working on a practical research problem under the supervision of a faculty member in FDSC, BISC, CHEM, BENG, or CHEG. The topic of this work should be approved for relevance to the certificate before the work begins and reviewed if it changes substantially during the course of the work. Work that involves industry partners is particularly encouraged. At the end of the final semester of the work, students would have to present a written and oral report of the work performed and lessons learned. Credit hours and work done for an honors degree can satisfy this requirement, but if honors work is used, it must include at least one credit hour in three different semesters.		
Elective courses		**6**
BIOL 2013	General Microbiology (ACTS Equivalency = BIOL 2004 Lecture)	
or BIOL 312		
BIOL 2533	Cell Biology	
or BIOL 2323	General Genetics	
CHEM 2613	Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture)	
or CHEM 36	Organic Chemistry II	
FDSC 3103	Principles of Food Processing	
FDSC 2603	The Science of Cooking	
FDSC 2523	Sanitation and Safety in Food Processing Operations	
FDSC 4122	Food Microbiology	
CHEG 2133	Fluid Mechanics	
CHEG 3144	Heat and Mass Transfer	
BENG 3113	Measurement and Control for Biological Systems	
BENG 3733	Transport Phenomena in Biological Systems	
HIST 1213		
Total Hours		**15**

Faculty

Acuff, Jennifer C., Ph.D. (Virginia Tech), M.S. (Kansas State University), B.S. (Abilene Christian University), Assistant Professor, 2020.

Atungulu, Griffiths Odhiambo, Ph.D., M.S. (Iwate University, Japan), B.S. (Jomo Kenyatta University of Agriculture and Technology, Kenya), Associate Professor, 2013, 2019.

Baum, Jamie I., Ph.D., B.S. (University of Illinois-Urbana-Champaign), Associate Professor, 2011, 2018.

Crandall, Philip G., Ph.D., M.S. (Purdue University), B.S. (Kansas State University), Professor, 1989, 1997.

Gibson, Kristen Elizabeth, Ph.D. (Johns Hopkins University), B.S. (University of Central Florida), Associate Professor, 2012, 2017.

Hettiarachchy, Navam S., Ph.D. (University of Hull, England), M.S. (Edinburgh University, Scotland), B.S. (University of Madras, India), University Professor, 1992, 2006.

Howard, Luke R., Ph.D., M.S. (University of Arkansas), B.S. (Purdue University), Professor, 2002.

Lee, Sun-Ok, Ph.D., M.S. (Iowa State University), M.S., B.S. (Dongduk Women's University, South Korea), Associate Professor, 2008, 2016.

Morawicki, Ruben O., Ph.D. (Pennsylvania State University), M.Eng. (State University of New York-Buffalo), B.S. (Universidad Nacional de Misiones, Argentina), Associate Professor, 2006, 2016.

Seo, Han-Seok, Dr.rer.Medic. (Technische Universität Dresden, Germany), Ph.D., M.Sc. (Seoul National University, South Korea), B.S. (Korea University, Seoul, South Korea), Associate Professor, 2012, 2017.

Siebenmorgen, Terrence J., Ph.D. (University of Nebraska-Lincoln), M.S.Ag.E. (Purdue University), B.S.Ag.E. (University of Arkansas), Distinguished Professor, 1984, 2015.
Subbiah, Jeyamkondan, Ph.D. (Oklahoma State University), M.S. (University of Manitoba, Canada), B.E. (Tamil Nadu Agricultural University, India), Professor, 2019.
Ubeyitogullari, Ali, Ph.D. (University of Nebraska-Lincoln), M.S., B.S. (Middle East Technical University, Turkey), Assistant Professor, 2021.
Wang, Ya-Jane, Ph.D. (Iowa State University), M.S. (University of Minnesota-Twin Cities), B.S. (National Taiwan University), Professor, 1999, 2009.

Courses

FDSC 1011. Exploring Topics in Food Science. 1 Hour.
Introduces the depth and scope of Food Science as a profession. This course emphasizes the importance of science in processing and preservation of food and discusses current topics and issues. Practical information on food processing, composition, additives, labeling, environmental issues, regulations, safety, sensory analysis, and health benefits will be provided. Curriculum offerings in Food Science will be related to job responsibilities as a Food Scientist. Lecture/discussions, 2 hours per week for 8 weeks. (Typically offered: Fall)

FDSC 1103. Introduction to Food Science. 3 Hours.
This course is designed to provide students with a general application and understanding of current issues associated with food products and food ingredients. Discussions will focus on controversial subjects involving food products, food additives, food safety and preservation techniques based on scientific principles and popular belief. Lecture/discussions/demonstrations, 3 hours per week. (Typically offered: Spring)

FDSC 2201. The Science of Chocolate. 1 Hour.
The objective of this course is to introduce you to the science and technology of chocolate production. You will learn the history, chemistry, and physics of chocolate. This course will provide you with an understanding of chocolate production steps, including cacao bean harvesting, fermentation, drying, roasting, grinding, and manufacturing, and how these unit operations affect chocolate texture and flavor. Special focus will be given to fat and sugar crystallization, sensory evaluation, and sustainability of chocolate production. (Typically offered: Spring)

FDSC 2201H. Honors The Science of Chocolate. 1 Hour.
The objective of this course is to introduce you to the science and technology of chocolate production. You will learn the history, chemistry, and physics of chocolate. This course will provide you with an understanding of chocolate production steps, including cacao bean harvesting, fermentation, drying, roasting, grinding, and manufacturing, and how these unit operations affect chocolate texture and flavor. Special focus will be given to fat and sugar crystallization, sensory evaluation, and sustainability of chocolate production. Prerequisite: Honors standing. (Typically offered: Spring)
This course is equivalent to FDSC 2201.

FDSC 2401. Uncorked: Vines to Wines. 1 Hour.
This introductory course is designed to provide students with an understanding of the basic concepts of growing grapes and winemaking, including history, grape growing, cultivars, chemistry, wine microorganisms, fermentation, winery operations, wine marketing, and the sensory and appreciation of wine. Coursework is expected to integrate lecture and guest presenters with supplement reading assignments. This course will not include wine tasting, therefore there are no age restrictions for enrollment. (Typically offered: Fall)

FDSC 2401H. Honors Uncorked: Vines to Wines. 1 Hour.
This introductory course is designed to provide students with an understanding of the basic concepts of growing grapes and winemaking, including history, grape growing, cultivars, chemistry, wine microorganisms, fermentation, winery operations, wine marketing, and the sensory and appreciation of wine. Coursework is expected to integrate lecture and guest presenters with supplement reading assignments. This course will not include wine tasting, therefore there are no age restrictions for enrollment. Prerequisite: Honors standing. (Typically offered: Fall)
This course is equivalent to FDSC 2401.

FDSC 2523. Sanitation and Safety in Food Processing Operations. 3 Hours.
Topics covered will provide an understanding of the control of microbial, chemical, and physical food hazards as well as emerging food safety issues. Course will include a discussion of sanitation, cleaners and sanitizers, sanitary equipment and facility designs, and microbial growth and control in food processing operations. Lecture/discussion. (Typically offered: Spring)

FDSC 2603. The Science of Cooking. 3 Hours.
In recent years science has found its way into the kitchen and cooking into laboratories and food processing plants. This course is designed to integrate science and cooking to help students appreciate the chemical and physical properties of foods and understand how the processes used when handling, preparing, and storing foods affect these properties. (Typically offered: Fall)

FDSC 2701. Food for Health. 1 Hour.
The course is designed for students interested in how foods affect one's health. This course provides students with a background of functional food that will enable them to understand, discuss, and evaluate functionality of food in relation to health. This class is designed to appeal to students studying food science, nutrition, biology, chemistry, nursing, and health and human performance. (Typically offered: Spring)

FDSC 2723. Introduction to Brewing Science. 3 Hours.
An introduction to the biology and chemistry of fermentation, with an emphasis on beer brewing. Styles, flavors, and quality characteristics of beer will be discussed. The history, legal aspects, and economic impacts of homebrewing as well as craft and industrial brewing will be covered. Coursework is expected to integrate lectures and guest presenters with supplemental reading assignments. This course will not include beer tasting, therefore there are no age restrictions for enrollment. Prerequisite: (CHEM 1123 or CHEM 1073) and (BIOL 1543 or BIOL 1584). (Typically offered: Spring)

FDSC 3103. Principles of Food Processing. 3 Hours.
The course is designed as an overview of the unit; food processing operations common to all types of food processing plants. Examples will be drawn from international food processing operations processing fruits and vegetables, poultry and meats, and oil seeds and cereal grains. Emphasis on oral communication and critical thinking skills. Corequisite: Lab component. Prerequisite: CHEM 1123 and CHEM 1121L and (MATH 2043 or MATH 2554). (Typically offered: Fall)

FDSC 3202. Introduction to Food Law. 2 Hours.
Discussion of government laws and regulations affecting the manufacture of food. Emphasis is on federal regulations relating to food safety, labeling, and the FDA. Discussion relates to practical use of food law. Lecture 2 hours per week. (Typically offered: Spring)

FDSC 3202H. Honors Introduction to Food Law. 2 Hours.
Discussion of government laws and regulations affecting the manufacture of food. Emphasis is on federal regulations relating to food safety, labeling, and the FDA. Discussion relates to practical use of food law. Prerequisite: Honors standing. (Typically offered: Spring)
This course is equivalent to FDSC 3202.

FDSC 400V. Special Problems. 1-4 Hour.
Investigation of assigned problems in food science. Prerequisite: Junior standing. (Typically offered: Fall, Spring and Summer)

FDSC 4111L. Food Analysis Lab. 1 Hour.
Laboratory exercises providing students with experience of analytical techniques and instrumentation used in food analysis. Laboratory 3 hours per week. Corequisite: FDSC 4113. Prerequisite: FDSC 4304 and CHEM 1123 and CHEM 1121L and CHEM 2613 and CHEM 2611L or (CHEM 3603 and CHEM 3601L). (Typically offered: Spring)

FDSC 4113. Food Analysis. 3 Hours.
Methods of analysis, instrumentation, and laboratory techniques for measuring the chemical composition of raw and value-added products. Lecture 3 hours. Corequisite: FDSC 4111L. Prerequisite: FDSC 4304 and CHEM 1123 and CHEM 1121L and CHEM 2613 and CHEM 2611L or (CHEM 3603 and CHEM 3601L). (Typically offered: Spring)

FDSC 4121L. Food Microbiology Lab. 1 Hour.
A hands-on laboratory course designed to teach students microbiological techniques and certain enumeration and plating techniques of specific food spoilage and pathogenic bacteria. Prerequisite: BIOL 2013 and BIOL 2011L. Pre- or Corequisite: FDSC 4122. (Typically offered: Fall)

FDSC 4122. Food Microbiology. 2 Hours.
The study of food microbiology including classification/ taxonomy, contamination, preservation and spoilage of different kinds of foods, pathogenic microorganisms, food poisoning, sanitation, control and inspection and beneficial uses of microorganisms. Prerequisite: BIOL 2013 and BIOL 2011L or BIOL 2533. (Typically offered: Fall)
This course is cross-listed with BIOL 4122.

FDSC 4304. Food Chemistry. 4 Hours.
Water, carbohydrates, lipids, proteins, vitamins, and minerals in foods; biochemical and functional properties, enzymes, food additives (emulsifiers, pigments, colors, flavors, preservatives, and sweeteners) and texture as related to properties in food systems and during processing. Lecture 3 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: CHEM 1123 and CHEM 1121L and CHEM 2613 and CHEM 2611L or (CHEM 3603 and CHEM 3601L). (Typically offered: Fall)

FDSC 431V. Internship in Food Science. 1-4 Hour.
The Food Science Internship is a supervised practical work experience with a food industry, research program or governmental agency to gain professional experience and insight into career opportunities. Prerequisite: Junior standing and consent. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

FDSC 4413. Sensory Evaluation of Food. 3 Hours.
Principles and procedures for sensory evaluation of food. Appropriate uses of specific tests are discussed, along with physiological, psychological, and environmental factors affecting sensory verdicts. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: STAT 2303 or BUSI 1033 or STAT 2823 or PSYC 2013. (Typically offered: Fall)

FDSC 4513. Cereal Processing Technology. 3 Hours.
Fundamental concepts of heat and mass transport in grains; cereal/grain structure, property and composition; cereal/grain processing systems and technology; cereal/grain co-product processing technology and value recovery; cereal/grain quality metrics, grading standards and food safety assurance. Prerequisite: FDSC 3103 or FDSC 4754 or with instructor permission. (Typically offered: Spring Odd Years)

FDSC 4713. Product Innovation for the Food Scientist. 3 Hours.
This is a capstone course integrating knowledge developed in Food Science to the development of new food products. This course will take an integrated multidisciplinary approach to developing innovative food products and will provide learning experiences in new product development and Research & Development. Topics include product formulation, ingredient interactions, sensory analysis, packaging, labeling, food safety and food law. Corequisite: Lab component. Pre- or Corequisite: FDSC 4113 and FDSC 4111L. Prerequisite: Senior standing, FDSC 4304, FDSC 3103, and FDSC 4413. (Typically offered: Spring)

FDSC 472V. Special Topics in Food Science. 1-4 Hour.
Discussion focused on selected topics of particular fields of raw product physiology, food processing, chemistry, physiology, microbiology, evaluation, sensory analysis, and preservation. (Typically offered: Irregular) May be repeated for up to 4 hours of degree credit.

FDSC 4754. Engineering Principles of Food Processing. 4 Hours.
Basic mechanics of refrigeration, temperature controls, materials handling and mechanical problems as applied to foods and food processing. Lecture 3 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: MATH 1213, MATH 2554, PHYS 2013, PHYS 2011L and FDSC 3103. (Typically offered: Spring)