2018 Guidelines for Initial IFT Approval of Undergraduate Food Science and Food Technology Programs

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This document includes program requirements for IFT Approval of undergraduate food science and food technology programs. It is intended to help undergraduate programs with their preparation of their approval submissions. Additional instructions and support documents will be made available on IFT.org.

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Program Requirements: Administrative and Physical

Organization

The academic program will be administered by an administrative unit that can adequately sustain an academic program, preferably a separate organized department with an identifiable budget. The institution must a) be an accredited educational institution, and b) have graduated students from the program prior to requesting IFT approval.

Food Science Facilities

- *Teaching laboratories* with facilities and equipment to conduct chemical, engineering, processing, sensory, and microbiological exercises as necessary to meet the Standards.
- *Pilot-plant facilities* used to teach principles of unit operations and food processing. If a pilot plant is not present, a plan of how alternate facilities are used in lieu of a pilot plant is required. The HERB will assess adequacy of the plan to meet the Standards.
- It is expected that infrastructure such as offices, classrooms, and library resources are available to support students and faculty.

Undergraduate Teaching Faculty

The food science faculty will be of a size and competence commensurate with the diversity of courses necessary to meet the defined Standards. A minimum of four (4) faculty members must have earned doctoral degrees in disciplines related to their teaching roles, and at least four (4) faculty members must have one post-baccalaureate degree in food science. The fields of faculty specialization must be distributed across the sub-disciplines necessary to teach the required food science courses.

Program Requirements: Curricular and Educational

Foundational Content

The academic program should include content that provides foundational knowledge in chemistry, physics and mathematics, biological sciences, nutrition, statistics, and oral and written communication. Foundational courses should fulfill the minimum specified credit hours* below.

- General Chemistry (minimum of 6 credit hours)
- Organic Chemistry (minimum of 3 credit hours)
- Biochemistry (minimum of 3 credit hours)
- General Biology (minimum of 3 credit hours)
- Microbiology (minimum of 3 credit hours)
- Human Nutrition (minimum of 3 credit hours)
- Calculus (minimum of 3 credit hours)
- General Physics (minimum of 3 credit hours)
- Statistics (minimum of 3 credit hours)
- Written Communication (minimum of 2 credit hours)
- Oral Communication (minimum of 2 credit hours)

*One credit hour, according to the United States Department of Education (USDOE), is defined as the amount of work represented in intended learning outcomes and verified by evidence of student

achievement that is an institutional established equivalence that reasonably approximates not less than:

(1) One hour of classroom or direct faculty instruction and a minimum of two hours of out of class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or
(2) At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.

[Note: if your program does not fulfill the foundational content requirements listed above, a plan is required to demonstrate how a particular content area is embedded in alternate courses. The HERB will assess adequacy of the plan to meet the Standards.]

Foundational content descriptions. The descriptions below represent foundational curricular content recommendations that IFT considers essential.

General chemistry. Basic principles of chemical and physical properties and transformations of materials (*Topics include*: energy and its uses, gas laws, kinetic molecular theory, laws of chemical combination, atomic and molecular structure, periodic classification of the elements, and chemical bonding). Principles of equilibrium and chemical change (*Topics include*: chemical equilibria, acid/base chemistry, and other ionic equilibria, electrochemistry, elementary chemical thermodynamics and kinetics).

Organic chemistry. Basic nomenclature, structure, synthesis, stereochemistry, and mechanisms of organic reactions, chemistry of organic compounds (*Topics include*: alkanes, alkenes, alkynes, aromatic compounds, alkyl halides, alcohols, ethers, aldehydes and ketones, carboxylic acids and their derivatives, phenols, amines, fats, amino acids, carbohydrates).

Biochemistry. Basic concepts of biochemical structure-function relationships, reactivity, and thermodynamics (*Topics include*: biological structures, enzymes, membranes, energy production, carbohydrate, lipid, and amino acid metabolism, signal transduction, transport across membranes, DNA replication and repair, transcription and translation, molecular motors, mechanisms of drug action, and the biosynthesis of natural products, biofuels, and biomaterials).

General biology. Basic concepts of the basis of living systems, cell and molecular biology, mitosis and meiosis, principles of genetics, developmental biology. (*Topics include*: chemistry, biochemistry of macromolecules, cell structure and function, photosynthesis, respiration, evolution, the diversity of life and DNA structure and replication).

Microbiology. Basic principles of microorganisms (*Topics include*: bacteria, yeasts, molds, and viruses; microbial cell structure and function, metabolism, microbial genetics, and the role of microorganisms in disease, immunity, and other selected applied areas).
Basic techniques employed in the investigation of microbial activities and properties (*Topics include*: handling, identification, and characterization of microorganisms and their activities).

Human nutrition. Basic principles of nutritive value of foods and metabolism of essential nutrients (*Topics include*: description, digestion, absorption, metabolism, interactions and functions of nutrients, nutrient and energy requirements, and nutrient deficiencies).

Calculus. Basic principles of calculus (*Topics include*: limits, derivatives, differentiation, linear approximation, curve sketching, optimization, the chain rule for polynomials, integrals, trigonometric functions, and exponential functions).

General physics. Basic principles of physical properties and laws (*Topics include*: mechanics, work and energy, fluids, thermodynamics, waves, electromagnetism, optics, relativity, and modern physics).

Statistics. Basic principles of statistics (*Topics include*: descriptive statistics, probability, normality, estimation, hypothesis testing, statistical inference, and confidence intervals).

Written communications. Basic principles and practice in writing and speaking (*Topics include*: research-based writing and the construction of academic, argumentative essays using primary and secondary sources as evidence).

Oral communications. Preparation and presentation of informative and persuasive speeches (*Topics include*: selection and organization of material, methods of securing interest and attention, and the elements of delivery).

IFT Program Goals, Standards, and Essential Learning Outcomes (ELOs)

The ***IFT Program Goals*** serve as an overarching expectation of an IFT-approved academic program. The ***Standards*** (formerly Core Competencies) encompass the academic content and skills under the four IFT Program Goals. The Standards provide the framework to assess the ***Essential Learning Outcomes*** (***ELOs***) (Table 1). ELOs are measurable statements that describe the knowledge or skills students should acquire by the end of a particular assignment, class, course, or program. The academic program must require specific courses and learning activities that provide students with a deep understanding of the critical principles, concepts, and skills in the content areas of Food Science or Food Technology.

IFT Program Goals.

1. ***Graduates are competent in core areas of food science.***
2. ***Graduates can integrate and apply their knowledge.***
3. ***Graduates are proficient communicators.***
4. ***Graduates demonstrate professionalism and leadership skills.***

[Note: *Undergraduate programs are no longer required to design or provide assessment data for their program goals during annual reports*.]

Table 1. **Standards and Essential Learning Outcomes (ELOs)**

Standards	Essential Learning Outcomes*
Food chemistry (FC) The structure and properties of food components (water, carbohydrates, protein, lipids, other components and food additives); the chemistry of changes occurring during processing, storage, and utilization.	Upon completion of the required course work in this topical area, students will be able to: FC.1. Discuss the major chemical reactions that limit shelf life of foods. FC.2. Explain the chemistry underlying the properties and reactions of various food components. FC.3. Apply food chemistry principles used to control reactions in foods. FC.4. Demonstrate laboratory techniques common to basic and applied food chemistry. FC.5. Demonstrate practical proficiency in a food analysis laboratory. FC.6. Explain the principles behind analytical techniques associated with food. FC.7. Evaluate the appropriate analytical technique when presented with a practical problem. FC.8. Design an appropriate analytical approach to solve a practical problem.
Food microbiology (FM) Microorganisms in food including beneficial, pathogenic, and spoilage; the influence of the food system on their growth, survival, and control.	Upon completion of the required course work in this topical area, students will be able to: FM.1. Identify relevant beneficial, pathogenic, and spoilage microorganisms in foods and the conditions under which they grow. FM.2. Describe the conditions under which relevant pathogens are destroyed or controlled in foods. FM.3. Apply laboratory techniques to identify microorganisms in foods. FM.4. Explain the principles involved in food preservation via fermentation processes. FM.5. Discuss the role and significance of adaptation and environmental factors (e.g., water activity, pH, temperature) on growth response and inactivation of microorganisms in various environments. FM.6. Choose relevant laboratory techniques to identify microorganisms in foods.
Food safety (FS) Hazards (physical, chemical, biological) associated with foods and the food system; their transmission and control.	Upon completion of the required course work in this topical area, students will be able to: FS.1. Identify potential hazards and food safety issues in specific foods. FS.2. Describe routes of physical, chemical, and biological contamination of foods. FS.3. Discuss methods for controlling physical, chemical and biological hazards.

	FS.4. Evaluate the conditions, including sanitation practices, under which relevant pathogenic microorganisms are commonly controlled in foods. FS.5. Select appropriate environmental sampling techniques. FS.6. Design a food safety plan for the manufacture of a specific food.
Food engineering and processing (FE) Food engineering principles; food preservation and processing; packaging materials and methods; cleaning and sanitation; water and waste management.	Upon completion of the required course work in this topical area, students will be able to: FE.1. Define principles of food engineering (mass and heat transfer, fluid flow, thermodynamics). FE.2. Formulate mass and energy balances for a given food manufacturing process. FE.3. Explain the source and variability of raw food materials and their impact on food processing operations. FE.4. Design processing methods that make safe, high-quality foods. FE.5. Use unit operations to produce a given food product in a laboratory or pilot plant. FE.6. Explain the effects of preservation and processing methods on product quality. FE.7. List properties and uses of various packaging materials and methods. FE.8. Describe principles and practices of cleaning and sanitation in food processing facilities. FE.9. Define principles and methods of water and waste management.
Sensory science (SS) Analytical and affective methods of assessing sensory properties of food.	Upon completion of the required course work in this topical area, students will be able to: SS.1. Discuss the physiological and psychological basis for sensory evaluation. SS.2. Apply experimental designs and statistical methods to sensory studies. SS.3. Select sensory methodologies to solve specific problems in food.
Quality assurance (QA) Principles of food quality control and assurance.	Upon completion of the required course work in this topical area, students will be able to: QA.1. Define food quality and food safety terms. QA.2. Apply principles of quality assurance and control. QA.3. Develop standards and specifications for a given food product. QA.4. Evaluate food quality assessment systems (e.g. statistical process control).
Food laws and regulations (FL)	Upon completion of the required course work in this topical area, students will be able to: FL.1. Recall government regulatory frameworks required for the manufacture and sale of food products.

Government regulations required for the manufacture and sale of food products.	FL.2. Describe the processes involved in formulating food policy. FL.3. Locate sources of food laws and regulations. FL.4. Examine issues related to food laws and regulations.
Data and Statistical Analysis (DS) Collection, analysis, interpretation, and presentation of data.	Upon completion the required course work and additional research activities provided from the program, students will be able to: DS.1. Use statistical principles in food science applications. DS.2. Employ appropriate data collection and analysis technologies. DS.3. Construct visual representation of data.
Critical thinking and problem solving (CT) Scientific reasoning through uncertainty in scientific and technical situations.	Upon completion of the required course work and additional activities provided from the program, students will be able to: CT.1. Locate evidence-based scientific information resources. CT.2. Apply critical thinking skills to solve problems. CT.3. Apply principles of food science in practical, real-world situations and problems. CT.4. Select appropriate analytical techniques when presented with a practical problem. CT.5. Evaluate scientific information.
Food Science Communication (CM) Oral and written communication.	Upon completion of the required course work and additional activities provided from the program, students will be able to: CM.1. Write relevant technical documents. CM.2. Create oral presentations. CM.3. Assemble food science information for a variety of audiences.
Professionalism and leadership (PL) Organization and project management; skills necessary to work and interact with individuals from diverse backgrounds.	Upon completion of the required course work and additional and leadership activities provided from the program, students will be able to: PL.1. Demonstrate the ability to work independently and in teams. PL.2. Discriminate tasks to achieve a given outcome. PL.3. Describe social and cultural competence relative to diversity and inclusion. PL.4. Discuss examples of ethical issues in food science.

* The measurable verbs for each ELO are color-coded to reflect levels of Bloom's Taxonomy (see Table 2).

Table 2. **Guide to Color Coding of Bloom's Taxonomy Levels:**