

FOOD 512 HAZARD ANALYSIS AND CRITICAL CONTROL POINTS SYLLABUS

Course Details

Course	FOOD 512 --- [3-0-0] (hours/week of lecture)
Prerequisites	None
Term/year	Winter term 1 (September - December 2020)
Class day/time	Wednesday and Friday / 6-7:30 pm PDT Thursday and Saturday/ 1-2:30 am UTC/ GMT
Class location	Online
Instructor	Nancy Ross
Email	nancy.ross@ubc.ca
Office	Virtual
Office hours	Wednesday and Friday
TAs	Krishnav Biyani
TA contact	Kbiyani1@mail.ubc.ca
Syllabus version	July 2, 2020

Course Objectives

This course focuses on the application of the scientific principles of HACCP (Hazard Analysis and Critical Control Point) for food safety programs at an advanced level. Undergraduate courses in microbiology, food processing, food plant hygiene and HACCP principles are required, although these prerequisites may be waived in discretion of the instructor.

These food science concepts will be reviewed in the first 8 hours of class by developing a HACCP plan for a food product using the Canadian Food Safety Enhancement Program (FSEP) procedure as a guideline. Good Manufacturing Practices (GMP) to control food safety hazards will be reviewed in this exercise. Students will prepare Standard Operating Procedures for the control of hazards.

Students attending this course should be familiar with basic statistical concepts such as: (i) data and data collection methods, (ii) statistical variables and their types (e.g., nominal, ordinal, continuous, discrete), (iii) descriptive statistics for summarizing the distribution of statistical variables (e.g., mean, median, mode, standard deviation, variance, percentiles, minimum, maximum), (iv) statistical graphics for data visualization (e.g., histograms, scatterplots), (v) experimental design (e.g., principles and types of experimental designs, regression and analysis of variance methods) and (vi) statistical quality control (e.g., sampling procedures, control charts, operating characteristic curves). The 7 Quality Tools will be reviewed and their use in a HACCP plan will be demonstrated.

To brush up on these statistical concepts prior to attending the course, students can the following references that is available as an e-book through the UBC Library:

Pripp, A.H. 2013. "Statistics in Food Science and Nutrition," Springer, New York.

Students will apply Statistical Process Control (SPC) techniques to a typical HACCP implementation situation. A case study format will encourage the students to function as a HACCP team. In the case study students will

prepare a quantitative hazard analysis and determine the CCP and establish the critical limits. Previous use of excel in preparation of control charts is an asset although not necessary. A supplemental tutorial will be available for required excel applications.

Verification of HACCP plans will be learned using a case study that also reviews and applies statistical sampling techniques. This exercise will involve a discussion of emerging food safety issues with microbial safety of spices as the case study. The role of environmental sampling procedures as an alternative to finished product sampling will also be evaluated.

A final module of the course will discuss validation of HACCP programs. Regulatory audits and 3rd party audits will be compared. The role of member organizations such as the American Society for Quality (ASQ) and its programs such as the ASQ Certified HACCP Auditor will be assessed.

Learning Outcomes

At the end of this course students will be able to:

- Explain the Principles of HACCP and demonstrate their effectiveness in the prevention of food safety hazards.
- Prepare HACCP program documentation for a food process that contains hazards controlled by good manufacturing practices, one or more CCPs (Critical Control Point) and/or uncontrolled hazards.
- Conduct a quantitative hazard analysis for the determination of a Critical Control Point.
- Apply statistical process control (SPC) techniques for hazard control.
- Analyze data from a food processing plant and construct sampling plans suitable for use in a HACCP plan.
- Outline the process for validation of a HACCP program.
- Enhance decision-making skills and develop an ability to apply analytical tools in true-to-life situations through preparing solutions to different case studies.

Course Format

Section 1. Management Commitment (HACCP Team Formation)

Reading: GOAL/QPC. 2010. Team Guidelines. in "The Memory Jogger," 2nd ed., GOAL/QPC pp. 194-200. GOAL/QPC, Salem.

HACCP is a team concept. The first step for a successful HACCP program is garnering management commitment. A letter of management commitment is a requirement in HACCP documentation. In this session students will prepare a group charter for their HACCP team activities and prepare the HACCP commitment letter for their team binder.

Sections 2 Preparation of HACCP Documentation

A HACCP Plan is a written document designed in accordance with the following steps to ensure control of food safety hazards within an establishment. There are 12 steps to developing each HACCP plan. These steps are as follows:

- 1) Assemble the HACCP team
- 2) Describe the product and identify its intended use
- 3) List product ingredients and incoming material
- 4) Construct a process flow diagram and confirm its accuracy
- 5) Construct a plant schematic and confirm its accuracy
- 6) Identify and analyze hazards (Principle 1)
- 7) Determine critical control point(s) (CCP) and other control measures i.e. process control (PC) and prerequisite programs (PP) (Principle 2)
- 8) Establish critical limits for CCP (Principle 3)
- 9) Establish monitoring procedures for CCP (Principle 4)
- 10) Establish deviation procedures for CCP (Principle 5)

- 11) Establish verification procedures for CCP (Principle 6)
- 12) Establish record keeping for CCP (Principle 7)

Steps 6 to 12 incorporate the 7 principles of HACCP developed by the Codex Alimentarius Commission. There are 10 specific forms that can be used for the documentation of a HACCP plan. These have been developed under the FSEP (Food Safety Enhancement Program) by CFIA (Canadian Food Inspection Agency). An establishment may use other forms if the content is equivalent and provides sufficient detail.

Each group will prepare Forms 1-10 for a Cold Smoke Salmon Operation. In this course we will use the HACCP Forms 1-10 that are used by the Canadian Food Inspection Agency FSEP program (Food Safety Enhancement Program)

A) *Preparing Basic Product Information*

Groups will prepare the basic product information and hazard analysis and control for a Cold Smoke Salmon food process, the food process will be a RTE (Ready to Eat) food product. The case study is available in CANVAS. (Preparing the Basic Product Information for a HACCP Plan).

B) *Hazard Analysis and Control*

I. Raw Material Hazard Analysis

Reading: (available on CANVAS).

Ross, N. 2012. Designing Safety into Products and Processes. Adapted from Mortimore, S. and Wallace, C. 2001. "HACCP A Practical Approach," 2nd ed. Aspen Publishers, Gaithersburg, and Surak, J. G. and Wilson S. 2007. "The Certified HACCP Auditor Handbook," 2nd ed. ASQ Quality Press, Milwaukee.

References:

Mortimore S. and Wallace C. 2013. "HACCP: A Practical Approach," 3rd ed. Springer, New York.

Mortimore S. and Wallace C. 2015. "HACCP: A Food Industry Briefing," 2nd ed. Wiley Blackwell, UK.

Downes, F and Ito, K. 2001. "Compendium of Methods for the Microbial Examination of Foods". 4th ed. American Public Health Association. Washington, DC.

Surak, J. G. and Wilson S. 2007. "The Certified HACCP Auditor Handbook," 2nd ed. ASQ Quality Press, Milwaukee.

Each group will prepare a raw material hazard analysis for the salmon ingredient used in the Cold Smoke Salmon process. This analysis will support the hazard control decisions made on Form 5, 6 and 7.

You must demonstrate that you researched the literature in preparation for writing the report. The bibliography for your report may include some review articles and information from credible websites, but the majority of references must be from primary, peer-reviewed sources (scientific journals, textbooks).

II. Process Hazard Analysis

Each group is to complete a total of 30 hazards on Forms 5, 6 and 7 (or equivalent, you may put B, C and P hazards on the same form). You may split it up between the forms any way you want but take the opportunity to identify all three hazard categories (B, C, P). Use the two-part statement when describing hazards. The generic models that are available on the CFIA website as well as the Seafood Safety information on the Government of BC website can be used as a guide. <http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/fisheries-and-aquaculture/seafood-safety>

Select the appropriate Prerequisite Program to control the identified hazards. The CFIA hazard database is available on CANVAS in the HACCP learning module and can be used to help identify hazards.

III. Preparation of a Standard Operating Procedure

Standard operating procedures (SOPs) are the documented processes that a food establishment has in place to ensure food processing activities are done consistently every time. They contain detailed, written instructions of routine operations.

Each group will prepare a SOP for the Cold Smoke operation that provides the description for their smoking operation. This SOP will provide an explanation for the process your team has developed and should provide sufficient detail so that it could be used as a training tool for the operator in the cold smoke operation. Here are some links to articles about how SOPs are used in HACCP plans.

This is a link to a Government of Manitoba document that describes the parts of a written Standard Operating Procedure.

https://www.gov.mb.ca/agriculture/food-safety/at-the-food-processor/food-safety-program/pubs/fs_21.pdf

There are two articles posted in the Hazard Analysis and Controls course content folder.

Section 3 Validation and Auditing of HACCP Program

Every food establishment must demonstrate that the critical control points (CCP) are capable, on a consistent basis, of achieving the intended level of hazard control. Validation is performed at the time the CCP is designed, or when changes indicate the need for re-validation. Validation of a CCP is, whenever possible, performed before it is fully implemented.

Depending on the CCP that is being validated, the validation documentation may include:

- Scientific, technical or regulatory support to demonstrate that the selected critical limit is effective for control of the hazard;
- Commissioned testing data specific for a piece of equipment (e.g. pasteurizer) to demonstrate that the equipment can meet the selected critical limit;
- Supporting data to demonstrate that the monitoring procedures are effective enough to detect loss of control at a CCP before the finished product leaves the control of the producing establishment.

Validation is also required for control measures covered by prerequisite programs that have an immediate impact on food safety (e.g., new technology for water treatment).

Individual Assignment – Validation Questions

To prepare for this section each student will submit an individual assignment answering questions from the following reading that is available in Canvas.

CAC. 2008. Guidelines for the Validation of Food Safety Control Measures. Codex Alimentarius
CAC/GL 69 - 2008

Using the HACCP program at a RTE assembled food product establishment as a model the class will prepare a proposed validation study for a control measure in the program. See Example 6: Validation of a Safe-handling Label for Table Eggs as an Example (CAC/GL 69-2008).

Introduction to Attribute Sampling

References:

ASQ 2005. American National Standard – Introduction to Attribute Sampling. American Society for Quality Control. ANSCI/ASQC S2-1995

A number of well publicized salmonella outbreaks traced to food have heightened public awareness of the

need to ensure food safety programs are in place. This module looks at the role microbiological testing can play.

Auditing and GFSI (Global Food Safety Initiative)

Assignment: Selection of Audit Scheme by a Food Establishment - GFSI Recognized Schemes

The selection of an audit standard to be used by a food establishment is an important business decision. In this module the GFSI auditing standards will be examined.

Section 4 HACCP Coordinator Job Description

The Food Processing Human Resource Council of Canada (FPHRC) has developed a National Occupational Standard for a HACCP Coordinator. In this final section of the course participants will prepare a job description for this important HACCP job. Job descriptions are a vital component of the Personnel Training Prerequisite program.

Learning Activities

The activities in this course prepare the student to participate in a HACCP team in a food plant. A major project for the course is to prepare a selection of typical documents that are standard requirements for preparation of HACCP documentation. This HACCP document binder is a compilation of the projects listed below.

Students will prepare this HACCP binder in groups. Groups are self-selected with a maximum of five (5) students per group. Group assignments will earn an overall group mark which may be adjusted to reflect individual contributions to the group. A group evaluation form is available on CANVAS and must be submitted to the instructor by the last day of classes.

Course Readings

Guide for preparing a preventive control plan for domestic food businesses

<https://www.inspection.gc.ca/preventive-controls/preventive-control-plans/guide/eng/1427746591578/1427746679297>

Hazard Analysis and Critical Control Point/Food Safety Enhancement Program. Canadian Food Inspection Agency.

<http://www.inspection.gc.ca/english/fssa/polstrat/haccp/haccpe.shtml>

IFT. 2002. IFT Expert Report on Emerging Microbiological Food Safety Issues. Implications for the 21st century. Institute of Food Technologists, Chicago,

Codex Alimentarius Background Documents in Food Safety (<http://www.codexalimentarius.org>)

Codex Alimentarius Commission. Procedural Manual. 19th Edition

- **General Principles of Food Hygiene**
- Guidelines for the Validation of Food Safety Control Measures
- Guidelines on The Application of General Principles of Food Hygiene to the Control of *Listeria monocytogenes* in Foods
- Guidelines on the Judgment of Equivalence of Sanitary Measures Associated with Food Inspection and Certification Systems
- Principles for the establishment and application of microbiological criteria in food
- Working Principles for Risk Analysis for Food Safety for Application by Governments.

Suggested References:

Besterfield, D.H. 2004. "Quality Control," 7th ed. Pearson Prentice Hall, Columbus.

Mortimore S. and Wallace C. 2013. "HACCP: A Practical Approach," 3rd ed. Springer, New York.

Mortimore S. and Wallace C. 2015. "HACCP: A Food Industry Briefing," 2nd ed. Wiley Blackwell, UK.

Surak, J. G. and Wilson S. 2007. "The Certified HACCP Auditor Handbook," 2nd ed. ASQ Quality Press, Milwaukee.

Learning Resources

UBC Library has a series of [undergraduate user guides](#) to support your learning. For the upcoming terms, their [Online Learning video tutorial](#) and UBC's [Keep Learning website](#) are helpful resources.

Course Schedule

See Schedule posted in Canvas

Course Assessment

The final course grade will be made up of the following:

Midterm 1 Exam 20%

Midterm 2 Exam 30%

Group Projects (Preparation of HACCP documentation binder) 40%

Individual Projects and Quizzes 10%

Examinations:

There will be a first midterm exam after the first 4 weeks of classes and a second midterm after 8 weeks.

There will be no final exam. The format of the exams includes short answer questions, multiple choice and short case studies. The case study questions involve completion of HACCP documentation forms such as hazard analysis forms, HACCP plan (Principles 1 to 7) and preparation of an audit report.

Group Project:

The evaluation of the binder is done to simulate the type of audit that would be done on these materials in a food processing establishment by a 3rd party auditor.

The binder will be given a mark out of 40 and will be evaluated as outlined in the following HACCP Documentation Binder Learning and Grading Rubric.

Students are encouraged to function as a HACCP team and include HACCP team meeting notes and HACCP amendment logs throughout the course and development of their group binder. Group marks will be assigned to the group as a whole.

HACCP Documentation Binder Learning and Grading Rubric

Section	Possible Marks	Excellent	Good	Needs Improvement	Unacceptable
SECTION 1- Management Commitment, HACCP team meeting notes					
<i>Overall group rating</i>	5	Rating of overall first impression of Group HACCP Documentation Binder final submission. Groups will be ranked based on overall effort and features of their binder, participation and attendance demonstrated by the group. Improvements and edits resulting from instructor feedback are assessed.			
<i>Group HACCP Documentation Binder</i>	10	All group members contribute and embrace HACCP team simulation activities. HACCP team members roles are defined in team charter. HACCP culture developed.	All components of HACCP Documentation binder completed.	Binder incomplete or not in logical order for HACCP program.	No record of group meetings. Inconsistent participation by group members, group members absent. Suggested edits not done.
Section 2 – HACCP Documentation					
A) Basic Product Information:					
<i>Forms 1- 3 Food Product with CCP</i>	10	Basic product information well documented. Demonstrate previously learned food science knowledge during preparation of forms i.e. product quality attributes associated with food safety, labelling, food processing techniques. Forms properly formatted (date of preparation, signature of responsible HACCP personnel). HACCP team adds B, C, and P symbols after completion of hazard analysis in subsequent section of course.	Basic product information forms are completed but demonstrate a tendency towards rote behaviour from available HACCP generic models.	Forms incomplete and do not include details of case study. Important product quality attributes missing,	Significant details omitted in forms. Form 2, List of Inputs does not match Form 3, Process Flow diagram. Incomplete process flow; not all steps included.
<i>Form 4 Plant Schematic- plant with allergens</i>	10	Schematic shows all material and personnel flows with well-defined legend for the map. Other food safety details such as hand wash stations, waste containers and sanitation stations identified. Areas of cross contamination (raw/processed, allergens) clearly identified.	Plant schematic matches Form 3, process flow diagram. Some distinction between materials and personnel flow in legend. Incomplete identification of allergen cross contamination risks.	Unclear distinction between materials and personnel flow. No identification of cross contamination risks; no hazard symbols on map.	No legend. Plant schematic flow does not match Form 3, Process Flow diagram

HACCP Documentation Binder Learning and Grading Rubric

Section	Possible Marks	Excellent	Good	Needs Improvement	Unacceptable
B) Hazard Analysis and Control:					
<i>Raw Material Hazard Assignment:</i>	10	Breadth of analysis, use of decision tree, date completed in binder. Good distinction between hazards processed out of raw material, hazards dealt with by consumer i.e. cooking or raw materials that must be controlled as CCP.	Incomplete analysis. Do not consider all questions from raw material decision tree. No literature review on food safety considerations for raw material category.	Form 2, 5,6 and 7 complete but tendency towards rote behaviour from available HACCP hazard database for raw materials. No symbols on Form 2 after completion of hazard analysis.	Demonstrated lack of knowledge of processing effects on raw materials and hazard control.
<i>Preparation of Hazard Analysis for Food Process with CCP.</i>	10	Excellent use of two-part hazard description. All B, C, and P hazards identified at each process step. Method of hazard control for described hazards (i.e. PP, uncontrolled, CCP, and control point) complete and appropriate.	Incorrect use of hazard description format. Preventive control measure identified.	Hazard analysis done but demonstrates a tendency towards rote behaviour from available HACCP hazard database for process steps, i.e. selecting hazards that don't fit case study from the hazard database. Poor use of decision tree; selection of preventive control measure inappropriate to situation.	Incomplete hazard analysis at each process step. Incorrect selection of preventive control measure. Apparent lack of background food science knowledge to complete hazard analysis.
<i>Preparation of Standard Operating Procedure (SOP) for Preventive Control Measure.</i>	5	SOP is properly formatted; purpose, task, frequency, corrective actions, records, person responsible. Suitable for use as a training tool in a food processing establishment. Auditable details such as created date, revision date and signature are included.	Corrective actions missing. Poorly formatted.	Standard Operating Procedure not suitable for stated purpose. Does not meet requirements of preventive control measure i.e. sanitation program, allergen control program	Lacking background processing knowledge and experience to prepare a SOP with sufficient detail.
<i>Critical Control Point (CCP) Determination and Control</i>	10	Demonstrates knowledge of food processing techniques. CCP properly identified using decision tree. HACCP principles 1-7 are applied correctly. Person responsible, task and method frequency for each principle. Record keeping includes related records from applicable preventive control measures associated with CCP.	Principles 1-7 addressed but corrective actions incomplete.	Records (principle 7) incomplete, lacks detail.	Lacking background processing knowledge and experience to prepare a HACCP plan with sufficient detail.

HACCP Documentation Binder Learning and Grading Rubric

Section	Possible Marks	Excellent	Good	Needs Improvement	Unacceptable
SECTION 3- Validating and Auditing your HACCP Plan:					
<i>Validation Questions (individual assignment)</i>	10	Reads Guidelines for the Validation of Food Safety Control Measures and submits answers to questions on time.	Reads article and prepares answers to questions.	Skims article, does not prepare submission.	Not submitted
Corrective Action Report	6	Evaluate the deviation described in the scenario. Prepare an Action Plan that includes short and long-term measures and a root cause analysis. .	The template Action Plan provided in course materials is complete. Incomplete long-term solution.	Corrective Action Report lacks formatting details.	Incomplete problem analysis and no conclusion on root cause.
<i>Global Food Safety Initiative (GFSI) scheme decision assignment:</i>	6	Write a letter to the owner of the cold smoke salmon plant indicating which GFSI scheme they should pursue. GFSI scheme selection is appropriate to assigned food commodity. Ease of understanding groups decision process. Submission is easy to read and covers all questions required by management when making decision on GFSI scheme to select for organization i.e. cost, certification body.	Sufficient detail on components of GFSI scheme provided. Group contributes to in class discussion during preparation of comparison and contrast matrix for the benchmarked GFSI schemes.	Answers to decision making questions for selection of appropriate scheme lack detail and facts. Group does not contribute to comparison and contrast matrix for the benchmarked GFSI schemes.	Answers to questions incomplete or poorly documented, e.g. point form, cut and paste
Total:	100				

Academic integrity

The academic enterprise is founded on honesty, civility, and integrity. All UBC students are expected to behave as honest and responsible members of an academic community. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work.

It is the student's obligation to learn, understand and follow the standards for academic honesty. Students must be aware that standards at the University of British Columbia may be different from those in secondary schools or at other institutions.

Violations of academic integrity lead to the breakdown of the academic enterprise, and therefore serious actions are taken. Plagiarism or cheating may result in a mark of zero on an assignment, exam, or course. More serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Academic misconduct may result in a one-year suspension from the University and a notation of academic discipline on the student's record.

The [UBC library](#) has a useful Academic Integrity website that explains what plagiarism is and how to avoid it. If a student is in any doubt as to the standard of academic honesty in a particular course or assignment, then the student must consult with the instructor as soon as possible. A more detailed description of academic integrity, including the University's policies and procedures, may be found in the [Academic Calendar](#). All course work is required to be submitted to Turnitin.com for review.

University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on [the UBC Senate website](#).