

Food Product Development (CFS 480/680; **3 Credits: Two-3 hour laboratories**)

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Office Hours: MWF 10-11 am

Room: Harris Hall 11; Baking Lab

Time: T 8:30-11:20; Th 8:30-11:20

Bulletin description:

This course is designed to provide students the opportunity to incorporate the basic principles of food science in the theoretical development of food products. (Food Science Capstone)

Course Description

The end-result of a food science education is that a student can integrate fundamental knowledge into real world situations. This course will engage students in the product development process using a team approach that is prevalent in the food industry. Students will be required to access a variety of resources to accomplish the mission of designing a food product.

Instructional Objectives

1. Be able to identify the processes and stages required to bring a new food product from conception to commercialization.
2. Create, in the laboratory, a prototype of a new product that has a high probability of commercial production.
3. Be aware of the dynamics of working on a product development team.
4. Understand how to write a product formula and finished product specifications.
5. Know what technical and scientific data must be available before a product can be manufactured.

Relationship of course to other courses:

This course is the capstone courses for Food Science majors. This course is a culmination of all previously taken courses relevant to food systems and thus serves as the capstone course. A focus of the course will require that the student be able to utilize knowledge and experiences gained during their tenure at NDSU.

Required Resource

This course will be offered primarily through Blackboard on the internet. Students will be required to access, process, and print from Blackboard. In addition, students will be required to submit their assignments to the instructor via Blackboard or other electronic format. Each student is required to have a computer (or access to a computer), appropriate word processor, powerpoint, and internet connection.

Laboratory resources also will be required for the students to fulfill the development of the food product. Resources include such materials as food ingredients, laboratory equipment such as a balance, and access to statistical computer programs. New Food Product Development and Quality Control are two textbooks required for the courses.

Americans with disabilities statement about students with special needs

Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor as soon as possible.


Honor System

All students taking any course in the College of Agriculture, Food Systems, and Natural Resources are under the Honor System (<http://www.ag.ndsu.nodak.edu/colag/honor.htm>). The Honor System is a system that is governed by the students and operates on the premise that most students are honest and work best when their honesty and the honesty of others, is not in question. It functions to prevent cheating as well as penalize those who cheat. It is the

responsibility of the student to report any violations of the honor pledge to the instructor, honor commission, or the Dean of the College of Agriculture, Food Systems and Natural Resources.

All work in this course must be completed in a manner consistent with NDSU University Senate Policy, Section 335: Code of Academic Responsibility and Conduct (<http://www.ndsu.nodak.edu/policy/335.htm>) which states: The academic community is operated on the basis of honesty, integrity, and fair play. Occasionally, this trust is violated when cheating occurs, either inadvertently or deliberately.....Faculty members may fail the student for the particular assignment, test or course involved, or they may recommend that the student drop the course in question or these penalties may be varied with gravity of the offense and the circumstances of the particular case.

Academic Dishonesty/Plagiarism (from Wolf-Hall, 2006): Familiarize yourself with what plagiarism is at <http://www.plagiarism.org>. Here are some examples of plagiarism as quoted/copied from www.plagiarism.org as viewed on January 5, 2009:

copying word for word from anything and not using quotation marks and citing the source	<p>▪ Believe it or not...</p> <p>Changing the words of an original source is not sufficient to prevent plagiarism. If you have retained the essential idea of an original source, and have not cited it, then no matter how drastically you may have altered its context or presentation, you have still plagiarized.</p> 
turning in someone else's work as your own	
copying words or ideas from someone else without giving credit	
failing to put a quotation in quotation marks	
giving incorrect information about the source of a quotation	
changing words but copying the sentence structure of a source without giving credit	
copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not	

Course CFS 650 for Graduate Credit: Term Paper (Due Monday, November 28, 2011)

The course will be divided into two main modules. Module one emphasis will be on the basic food science information as related to food product development. Module two will utilize a team approach where students will be required to create a concept and develop a food product from an original concept. Because this course is team oriented, students will have an active part in the evaluation of other student team members. In addition, assignment of the student grade will be based partly on other student evaluations.

Modules

Module 1 –Basic Information (Topics):

1. Introduction and overview: Definition of roles. Product Concepts; how to proceed; factors to consider; concept methodology; consumer testing; Product attributes - what they are and their significance.
2. Concept testing approaches: sampling methods; role or sensory evaluation; preparation of concept testing documentation.
3. Requirements for product development authorization. Development of product specifications.

4. Prototype development: role of ingredients and processing in defining attributes; scale up.
5. Process flow sheet development: factors to consider in process development; process optimization; HACCP, GMP.
6. Factors to consider beyond formulation and processing: shelf life requirements; product performance testing; market positioning.
7. Integration of R&D: specifications; manufacturing and marketing developing test market strategies; how to run a plant trial.
8. Shelf-life requirements and factors affecting shelf-life and product attributes; method of assessment.
9. Product Roll-out; Road-blocks to successful product development.
10. Review

Module 2 –Team Basic Information (Topics)

1. Ideation and development of 10 ideas for screening; Market research and selection of 3 products for concept testing.
2. Determination of product attributes for 3 products; Project Management; Conduct Sensory panel and complete results.
3. Draft and present product development objectives as a part of a project authorization request; Formulation requirements; Develop a protocol for lab testing of prototype screening experiment; Determine process flow chart, become familiar with equipment needs.
4. Start development of a prototype product. Discuss formulation and what additives might be useful and arrange to obtain those not available. Continue to learn how to use production equipment.
5. Determine critical control points and how to assess them; Develop nutritional label; Consider packaging requirements; Look at scale-up requirements; Begin experimental development of prototype; Evaluation of product and determination of approach for optimization.
6. Continue production and evaluation of product; Process prototype product and evaluate.
7. Present product prototype to small trained panel of consumers, evaluation - complete with label and package design; Evaluate composition and characteristics of prototype product.
8. Produce final product and evaluate.
9. Test safety of product and characterize attributes; Final consumer testing and evaluation of results.

10. Continuation of consumer testing and final report preparation; Oral presentations and overall discussion of results; Final reports due.

NOTE: Attendance and participation are mandatory (please see class contract). An individual not present during a laboratory session (in class activity or summary report), but hands in a report, will be given zero (0) points for that writing assignment. If a known absence is expected, the student will be responsible for completing a portion of the exercise in advance of the expected date of absence from lab. You must give the instructor two (2) weeks notice of an absence or the absence will be treated as an unexcused absence and result in no points. The only exception to the 2 week absence rule is a death or hospitalization of a family member.

Tentative Schedule (Dr. Hall's Portion):

Date	Subject
Wk 1	Course Expectations, pre-test, Introduction and overview (Tues. Jan. 11). Start thinking about project for this semester.
Wk 1-2 (Jan 11-20)	Product Development: From Concept to Product (Lecture) Topics Covered: Definition of roles. SWOT Analysis in Product Development. Product attributes - what they are and their significance. In-class activity: Ideation (brainstorming) and development of 10 ideas for screening using hypothetical scenario. Each person will be assigned a product from the brainstorming session and will then conduct a screening of product idea using SWOT analysis.
Wk 3 (Jan 25, 27)	Jan 25 – Introduction to Lab. Tour of PD lab Assignment 1: In Class Activity: Presentation of SWOT analysis of product ideas from brainstorming session. This assignment must be typed and then presented (powerpoint or word) to the class Jan 27. [NOTE: part of the assessment will be to grade the participation of other students]
Wk 4 (Feb 1,3)	Product Development: Concept testing and Market Assessment (Lecture) Assignment 2: Conduct a market assessment of the product completed during SWOT analysis. Complete a report highlighting your approach to assessing a concept (i.e. concept testing). The report will be presented to class during week 5. [NOTE: this will be a group report – part of the assessment will be to grade the participation of other group members]
Wk 5 (Feb 8,10)	Prototype development: role of ingredients and processing in defining product attributes. (Lecture) In Class Activity: Presentation of Market Assessment . Selection of product to move forward for the project due. .
Wk 6 (Feb 15, 17)	Exam on topics covered in Class up to Feb 10. On Tuesday Feb 15th. On Feb 19th Dr. Myers takes over the led role as instructor.

Assignment	Number	Points	Total Points
Short Papers	2	15	30
Team Member Evaluation	2	10	20
Term Exam	1	100	100

Tentative Schedule (Dr. Myer's Portion):

Dates: February 17th - May 5th

Note: Please review the CFS 480/680 Blackboard site daily for updates and valuable information. Please note that this document is dynamic in nature and is subject to change as the Professor-in-Charge, Dr. Myers, deems necessary to complete the development of the products.

General Topics to be Covered*

- A. Formulation Development & Scale-up
- B. Process Specification Development and In-Process Testing: Concept and Methodology
- C. Finished Product Development and Testing: Concept and Methodology
- D. Final Product Commercialization

Key Points for Dr. Myers Section

Attendance is mandatory. There are NO unexcused absences for the class. Timeliness is also required. Being habitually late to class will affect your grade. All students will be required to sign a class contract that will specify these requirements.

This class is a group activity and requires professionalism on the part of all students. Students will be assigned to teams by the Professors in the class and required to work together in a professional manner. As mentioned in "main" class syllabus, evaluation of other team members are a key part of the class. If there are any issues that need to be addressed in the working relationships of the group, please bring these issues to the professors in the class immediately to ensure that the working relationship is conducive to completing the class project. There will be a class exercise on style awareness to hopefully assist you in the team dynamics aspect of the course.

Leadership is a key part of the course. All students will be required to take a leadership role in the within the team. More information will be forthcoming concerning this aspect of the class.

Remember the four key questions that you always be challenged with as it relates to your product

- a. Who are the primary customers for your product?
- b. What products are you competing against in the marketplace; direct or indirect?
- c. Why should someone buy your product, e.g., what are the "selling points" for your product, i.e., nutrition, convenience, sensory attributes, unique or meets special need, etc.?
- d. How are you going to make your product, e.g, what are the major technical "hurdles" for your product?

Key Dates*

Week 6: February 17	Formulation Development. Lecture will include the role of group members and team expectations. <ol style="list-style-type: none">a. Assigned projects and teamsb. Your current product formulation for the purpose of procuring ingredients for the class.c. Project assignments: Each person in the class will be required to be responsible for one part of the project. Please decide which assignment
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you want to be responsible for:

- Formulation Leader: Responsible for the overall formulation development and completion of the product.
- Process Leader: Responsible for the overall scale-up process
- Quality Control Leader: Responsible for the development and completion of product specifications
- Commercialization Leader: Responsible for the development and completion of the final product package including the product label

Week 7	Feb 22 rd Formulation Development Feb 24 th Formulation Development Continued
Week 8	Mar 1 nd Formulation Development Continued Quiz 1 Mar 3 th Formulation Development Continued
Week 9	Mar 8: Process Development Mar 10: Process Development Continued Exam I Note: March 15 & 17 th University Spring Break Observed
Week 10	Mar 22: Process Development Continued Quiz 2 Mar 24: Scale-up Preparation
Week 11	Mar 29: Scale-up Preparation Continued Mar 31: Scale-up Preparation Continued
Week 12	April 5: Scale-up Process, Quiz 3 April 7: Scale-up Process Continued
Week 13	April 12: Specification Development April 14: Specification Development Continued Exam II
Week 14	April 19: Commercialization Quiz 4 April 21: Commercialization Continued
Week 15	April 26: Commercialization Continued Quiz 5 April 28: Final Presentation & Final Report Preparation
Week 16	May 3: Final Presentation & Final Report Preparation Continued May 5: Final Presentation & Final Report Preparation Continued
Finals Week May 10 (Tues) 10:30 –12:30	Final Presentation Oral presentations and overall discussion of results; Final reports due.

*Note: Topics and assignments could be changed based on the direction of the projects.

Evaluation Procedures and Criteria

Evaluations of student progress are based on reports related to the team updates on product development activities, exams and the project write-up and presentation. A guide describing the required report format is provided on the blackboard site and must be followed. In addition, the students will evaluate each of the other team members

Assignment	Number	Points	Total Points
Short Papers	2	15	30
Team Member Evaluation	2	10	20
Term Exam	1	100	100
Quizzes	5	20	100*
Examinations	2	50	100*
Presentation	1	100	100
Final Report	1	100	100
TOTAL POINTS			550

Grades

Percentage	Grade	Percentage	Grade
90-100	A	80-89.9	B
70-79.9	C	60-69.9	D
<60	F		

How are assignments evaluated?

The evaluation of the assignments is based on Bloom's Taxonomy, which is a system that describes the various levels of learning. The underlining principle of this system is to enhance student-thinking skills by providing students with challenges that are consistently more difficult as the student progresses in their field of study. Bloom's Taxonomy has been updated to reflect more accurately the systematic approach to learning. Please see the references below for the old terminology.

Anderson and Krathwohl (2001) updated Bloom's Taxonomy to the following:

Level 1. Remembering: Retrieving, recognizing, and recalling relevant knowledge from long-term memory.

Level 2. Understanding: Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.

Level 3. Applying: Carrying out or using a procedure through executing, or implementing.

Level 4. Analyzing: Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.

Level 5. Evaluating: Making judgments based on criteria and standards through checking and critiquing.

Level 6. Creating: Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.

As mentioned previously, Bloom's Taxonomy is the idea that individuals enhance their skills as they proceed through their education. For example, when first beginning to study a topic or concept, the student begins to remember concepts and terms. This is followed by level 2 or understanding which is a level where students begin to construct meanings for the concepts. As they continue to refine their understanding, students are able to **apply** the concept and **analyze** situations. Finally, when the topic has been mastered, the student should be able to **evaluate** ideas and **create** new ones.

Food Product Development is the capstone course for Food Science majors. Thus, the final 2 Bloom levels will be the major focus for student learning. This means that students should use knowledge gained from previous courses to evaluate and create a food product. Keep in mind that levels 1-4 will also be part of the learning processes; however, most of this course will require students to function at the upper Bloom levels. Thus, the expectations for students are more thorough research, and in-depth description, application, and analysis. Likewise, graduate students are expected to demonstrate strong logical thinking; clear and concise communication; correct application of the rules for grammar, capitalization, abbreviation, paragraph organization, and citation method; and an ability to format a document in a professional manner. These higher expectations will be critical in demonstrating graduate-level work.

References

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition, New York : Longman.

http://education.calumet.purdue.edu/vockell/edpsybook/bloom/bloom's_taxonomy.htm.

<http://www.coe.uga.edu/epltt/bloom.htm>

<http://www.coun.uvic.ca/learn/program/hndouts/bloom.html>

<http://www.officeport.com/edu/blooms.htm>,

<http://faculty.washington.edu/krumme/guides/bloom1.html>.

Short Papers (Project updates) – Overview (More Detailed Description will be presented on Blackboard)

The reports will focus on specific stages of product development where students must provide an update based on information relevant to their product development activity. The reports have a minimum limitation of one page and a maximum of three pages. A text font of 12 points and line spacing of 1.5 must be used in the report. Spelling will be evaluated. A given paper can have up to three spelling mistakes, above this; one point will be deducted for each spelling mistake.

The paper must follow the general format listed below if the total points are to be awarded. Each exercise will be graded on a 15 point scale for a total of 30 points. The following is the point breakdown and format for the reports:

1. **Title – 1 point**

- a. Title of paper
- b. Date
- c. Name(s)

2. **Objective(s) Section - 2 points**

In one to two sentences describe the overall objective in terms of the point(s) you will address in the body of the text.

3. **Main Body of Text - 10 points**

Information or knowledge gained during the hands on activity or during the search for information. In some activities, description of the hands-on activity and results will make up the major body of the text.

4. **Conclusion - 2 points**

Summation (1 to 2 sentences) of the major point of interest or the most significant piece of knowledge gained during the hands-on activity.