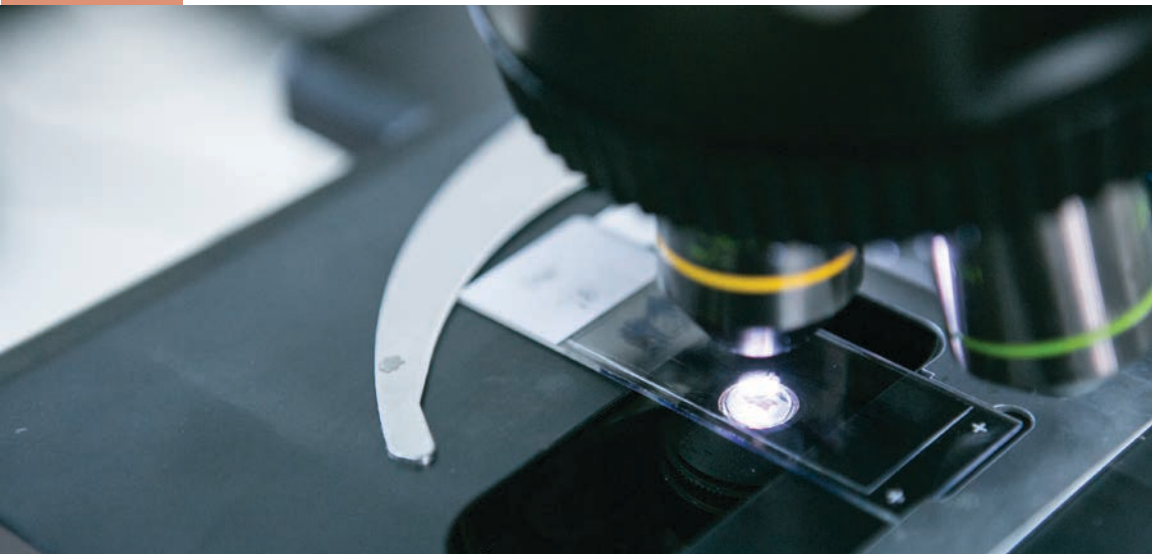


## **DOCTOR OF PHILOSOPHY PROGRAM IN FOOD SCIENCE AND TECHNOLOGY**

■ FACULTY OF AGRICULTURE, NATURAL RESOURCES AND ENVIRONMENT

## DOCTOR OF PHILOSOPHY PROGRAM IN FOOD SCIENCE AND TECHNOLOGY

Our department of Agro-Industry at Naresuan University, offering a Food Science and Technology Program, is a member of the Thailand Agro-Industry Academic Council Association (AIAC), which is a professional consortium. Our staff here is diverse and comprehensive, covering broad areas, such as food processing and engineering, food microbiology, food product development, food biotechnology, food nutrition, and food packaging. We have 199 research publications, 109 nationally and 90 internationally and also 9 patents in fortification and health products and process development of fruit and vegetables, rice, and fats and oils. The grant agencies including Naresuan University are the National Research Council of Thailand (NRCT), Thailand Research Fund (TRF), Agricultural Research Development Agency (ARDA), National Science and Technology Development Agency (NSTDA), Thai Health Promotion Foundation (Thai Health), and Thailand Toray Science Foundation. Besides this, as witness to our staff's excellent standing, they are recipients of the Outstanding Presentation Award, Award for Excellence in Scientific Research, Excellent Oral Presentation, National Outstanding Governmental Officers, Young Professional Achievement Award, and Best ASEAN Poster Award.



## Objectives

Desirable graduate attributes:

- Have in-depth research skills, adequate to discover new knowledge in food science and technology.
- Able to combine Food Science and Technology with other related fields.
- Have a commitment to life-long learning.
- Understand the concepts of ethical action and social responsibility.

## Admission

In accordance with the Graduate School Rules and Regulations. The program committee reserves the rights to require more qualifications as deemed appropriate.

## Medium of Instruction

Thai and English

### Research Focus

- Innovative Technology in Food Processing and Packaging
- Food Product Development
- Starch Technology
- Science and Technology of Fats and Oils
- Fermentation Technology

### Requirement for Graduation

In accordance with the Graduate School Rules and Regulations with the following additional requirements.

- Organize a seminar every semester for at least three semesters and present a paper in each seminar.
- Participate in a national or international conference at least once.
- Publish or be accepted for publication a part or the total research results of the dissertation by a journal approved by the Office of the Higher Education Commission.



# Doctor of Philosophy Program in Food Science and Technology

- FACULTY OF AGRICULTURE, NATURAL RESOURCES AND ENVIRONMENT

## Structure of the Program

### 1. Credit Requirements. \*

Requirements	Option 1.1	Option 1.2	Option 2.1	Option 2.2
Coursework	-	-	12	24
Core Courses	-	-	-	3
Electives	-	-	12	21
Required Non-credit Courses	6	6	6	6
Dissertation	48	72	36	48
<b>Total</b>	<b>48</b>	<b>72</b>	<b>48</b>	<b>72</b>

\* Minimum credits required.

### 2. Core Courses

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Advanced Food Analysis	-	-	-	-	-	-	108521	3
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>

### 3. Electives

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Minimally Processed Food	-	-	-	-	108513	3	108513	3

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Advanced Food Analysis	-	-	-	-	108521	3	-	-
Advanced Sensory Techniques	-	-	-	-	108523	3	108523	3
Physico-chemical Properties of Foods for Product and Process Development	-	-	-	-	108525	3	108525	3
Advanced Food Chemistry	-	-	-	-	108531	3	108531	3
Enzymes and Its Application in Food Industry	-	-	-	-	108533	3	108533	3
Advanced Cereal Science and Technology	-	-	-	-	108534	3	108534	3
Food Additives and Its Applications	-	-	-	-	108537	3	108537	3
Advanced Food Product Development	-	-	-	-	108552	3	108552	3
Advanced Food Microbiology	-	-	-	-	108561	3	108561	3
Fermentation Technology	-	-	-	-	108562	3	108562	3
Health Food and Assessment	-	-	-	-	108571	3	108571	3
Food Polymers and Its Applications	-	-	-	-	108574	3	108574	3
Mechanisms of Action of Food Preservation Procedures	-	-	-	-	108611	3	108611	3
Innovative Technology in Food Processing and Packaging	-	-	-	-	108612	3	108612	3
Advanced Data Analysis for Food Science and Technology	-	-	-	-	108622	3	108622	3

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Molecular Interactions of Foods	-	-	-	-	108633	3	108633	3
Rapid and Automation Techniques in Microbial Analysis	-	-	-	-	108661	3	108661	3
Foodborne Pathogens	-	-	-	-	108662	3	108662	3
Selected Topics in Food Science and Technology	-	-	-	-	108684	3	108684	3
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>≥12</b>	<b>7</b>	<b>≥21</b>

#### 4. Required Non-credit Courses.

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Research Methodology in Science and Technology	108522	3	108522	3	108522	3	108522	3
Seminar 1	108681	1	108681	1	108681	1	108681	1
Seminar 2	108682	1	108682	1	108682	1	108682	1
Seminar 3	108683	1	108683	1	108683	1	108683	1
<b>Total</b>	<b>4</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>4</b>	<b>6</b>

#### 5. Dissertation Credit Requirements.

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Dissertation 1 Option 1.1	108601	6	-	-	-	-	-	-
Dissertation 2 Option 1.1	108602	6	-	-	-	-	-	-
Dissertation 3 Option 1.1	108603	9	-	-	-	-	-	-
Dissertation 4 Option 1.1	108604	9	-	-	-	-	-	-

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Dissertation 5 Option 1.1	108605	9	-	-	-	-	-	-
Dissertation 6 Option 1.1	108606	9	-	-	-	-	-	-
Dissertation 1 Option 1.2	-	-	108607	9	-	-	-	-
Dissertation 2 Option 1.2	-	-	108608	9	-	-	-	-
Dissertation 3 Option 1.2	-	-	108609	9	-	-	-	-
Dissertation 4 Option 1.2	-	-	108691	9	-	-	-	-
Dissertation 5 Option 1.2	-	-	108692	9	-	-	-	-
Dissertation 6 Option 1.2	-	-	108693	9	-	-	-	-
Dissertation 7 Option 1.2	-	-	108694	9	-	-	-	-
Dissertation 8 Option 1.2	-	-	108695	9	-	-	-	-
Dissertation 1 Option 2.1	-	-	-	-	108696	3	-	-
Dissertation 2 Option 2.1	-	-	-	-	108697	6	-	-
Dissertation 3 Option 2.1	-	-	-	-	108698	6	-	-
Dissertation 4 Option 2.1	-	-	-	-	108699	9	-	-
Dissertation 5 Option 2.1	-	-	-	-	108701	6	-	-
Dissertation 6 Option 2.1	-	-	-	-	108702	6	-	-
Dissertation 1 Option 2.2	-	-	-	-	-	-	108703	3
Dissertation 2 Option 2.2	-	-	-	-	-	-	108704	6
Dissertation 3 Option 2.2	-	-	-	-	-	-	108705	6
Dissertation 4 Option 2.2	-	-	-	-	-	-	108706	9
Dissertation 5 Option 2.2	-	-	-	-	-	-	108707	9
Dissertation 6 Option 2.2	-	-	-	-	-	-	108708	9
Dissertation 7 Option 2.2	-	-	-	-	-	-	108709	6
<b>Total</b>	<b>6</b>	<b>48</b>	<b>8</b>	<b>72</b>	<b>6</b>	<b>36</b>	<b>7</b>	<b>48</b>



## Course Descriptions

### 108513 Minimally Processed Food

3(2-3-5)

This course examines the following topics: significance, definition, and categories of minimally processed food; biological, biochemical, physiochemical, and microbiological properties of minimally processed foods; factors affecting overall quality; unit operations; preservation technology; packaging and shelf life of minimally processed foods; and safety control procedures and quality assurance of the product.

### 108521 Advanced Food Analysis

3(2-3-5)

Principles and advanced analytical techniques of food properties including the following: spectroscopy techniques, chromatography technique, thermal techniques, rheological techniques and texture analysis, microscopic techniques, immunology techniques, genetic techniques, and sensory techniques.

### 108522 Research Methodology in Science and Technology

3(3-0-6)

A study of the following aspects: research definition; characteristics, goal types, and research processes; research problem determination; variables and hypotheses; data collection and analysis; proposal and research report writing; research evaluation; research application; research ethics; and research techniques in science and technology.

### 108523 Advanced Sensory Techniques

3(2-3-5)

A study of sensory evaluation techniques and their applications in the food industry including the use of computer systems and statistical analysis of data, the linkage of sensory and instrumental measurements of food characteristics, and the interpretation and understanding of sensory data.

### 108525 Physico-chemical Properties of Foods for Product and Process Development 3(2-3-5)

Examination of the relationships between molecular interactions in foods, such as the water and phase transition, properties of colloids and emulsions, physico-chemical properties of foods and applications for product quality enhancement and process development.

### 108531 Advanced Food Chemistry 3(2-3-5)

A study of the structure and properties of food constituents, e.g., water, carbohydrates, proteins, lipids, and vitamins; the interactions of food constituents; types of metal complexes and their interactions with food; the functionality of food additives and applications; and recent advances in food constituents.

### 108533 Enzymes and Their Application in the Food Industry 3(2-3-5)

Principles of enzymes, enzymes in the food industry, milk and cheese production, the meat industry, the baking industry, the production of beverages and fruit juices, the starch and sugar industries, and the processing of fats and oils.

### 108534 Advanced Cereal Science and Technology 3(2-3-5)

Physico-chemical properties of cereal technology, postharvest technology, biochemical modification of cereal components, processing technology, and the functional properties and safety of cereal products.

### 108537 Food Additives and Their Applications 3(3-0-6)

A course of study of the definition and classifications of food additives, food additives and their use in products and processes, the regulation of food additive application in foods, and safety evaluations of food additives.

**108552 Advanced Food Product Development****3(2-3-5)**

Product development processes, processing technology, the application of prototype products, acceptability evaluation, consumer research and market evaluation techniques, and prototype scale-up guidelines.

**108561 Advanced Food Microbiology****3(2-3-5)**

A study of the following topics: the control of microorganisms in food by various methods, predictive modeling of microbial growth, microbial attachment to food and equipment surfaces, microbial foodborne diseases, the detection and determination of microorganisms in food and food environments, conventional and rapid methods, identification of microorganisms in food, biological controls, and biosensors.

**108562 Fermentation Technology****3(2-3-5)**

A study of fermentation processes, physiological factors controlling fermentation and biochemical pathways facilitating metabolites synthesis, the controlling of metabolites synthesis, types of fermentation, fermenters and equipment, safety in fermentation processes, fermented foods and other products, and kinetics of microbial growth.

**108571 Health Food and Assessment****3(2-3-5)**

A study of following topics: definition and criteria of health claims, isolation techniques of active components, efficacy determination of active components in in-vitro, animal and human studies, principles of nutrition for health food production, risks and mechanisms of degenerative diseases, recommendations for degenerative disease treatment, food production techniques and management, and laws and regulations of health food.

**108574 Food Polymers and their Applications****3(3-0-6)**

The integration of polymer science, material science, and chemistry principles as the basics for the characterisation of the physical properties of food polymers, such as proteins, starches, and hydrocolloids; specific properties and interactions of such polymers and their utilisation in the food industry.

**108601 Dissertation 1, Option 1.1****6 Credits**

Conducting an extensive literature review of topics related to the proposed research, preparing a draft research proposal which includes a research topic, the research problem statement, research objectives, justification for the research, and research procedures in brief; and submitting the proposal to the dissertation advisor.

**108602 Dissertation 2, Option 1.1****6 Credits**

Conducting preliminary research and analysis, preparing and submitting a dissertation proposal comprising details of the research components, nominating a prospective dissertation advisor to the graduate school, taking a dissertation defense, and submitting a progress report to the dissertation advisor.

**108603 Dissertation 3, Option 1.1****9 Credits**

Designing and conducting experiments, collecting and analysing data, and submitting a progress report to the dissertation advisor.

**108604 Dissertation 4, Option 1.1****9 Credits**

Designing and conducting experiments, collecting and analysing data, and submitting a progress report to the dissertation advisor.

**108605 Dissertation 5, Option 1.1****Credits**

Finalising experiments, collecting and analysing data, and preparing and submitting a final progress report to the dissertation advisor.

**108606 Dissertation 6, Option 1.1****9 Credits**

Preparing a dissertation, taking a final dissertation defense, and making any necessary rectifications or modifications before submitting a completed dissertation to the Graduate School.

**108607 Dissertation 1, Option 1.2****9 Credits**

Consulting and discussing the proposed research concepts with the dissertation advisor; researching related documents, books, academic journals, and research articles; and preparing and submitting a brief literature review to the dissertation advisor.

**108608 Dissertation 2, Option 1.2****9 Credits**

Conducting an extensive literature review of topics related to the proposed research; preparing a draft research proposal which includes a research topic, the research problem statement, research objectives, justification for the research, and research procedures in brief; and submitting the proposal to the dissertation advisor.

**108609 Dissertation 3, Option 1.2****9 Credits**

Preparing and submitting a completed dissertation proposal comprising details of the research components, nominating a prospective dissertation advisor to the Graduate School, and taking a dissertation defense.

### 108611 Mechanisms of Action of Food Preservation Procedures

3(3-0-6)

A study of the theories and mechanisms of action of food preservations that affect microorganisms; heat processing; lowering temperature; drying; raising osmotic pressure and lowering water activity and pH; the use of organic acids, esters, sulfites, and nitrites; modifying atmosphere; and the use of natural antimicrobials and combinations of food preservation processes.

### 108612 Innovative Technology in Food Processing and Packaging

3(2-3-5)

A study of thermal and non-thermal innovative technology in food processing, innovative packaging, and theories and applications in food industries.

### 108622 Advanced Data Analysis for Food Science and Technology

3(3-0-6)

Data analysis in relation to food science and technology using regression analysis, discriminant analysis and cluster analysis, principle component analysis, factor analysis, and the prediction of food property changes using mathematical models.

### 108633 Molecular Interactions of Foods

3(2-3-5)

This course examines the following topics: the interaction processes of food ingredients with other constituents in both real and model food systems; the application of rheological concepts and microscopic techniques to investigate interactions; the transformations mediated by water; the structure-function relationships of starches; and interactions involving lipids, proteins, enzymes, sweeteners, emulsifiers, and flavor components.

**108661 Rapid and Automation Techniques  
in Microbial Analysis** 3(2-0-6)

A study of the theories and applications of rapid methods and their automation in improving isolation, detection, and characterization; examination of membrane filtration techniques, electrical techniques, luminescent techniques, the polymerase chain reaction technique; and enumeration of microorganisms and microbial products in food and agricultural produce.

**108662 Foodborne Pathogens** 3(2-3-5)

A study of the types of foodborne diseases, infections, intoxication and virulence mechanisms of foodborne pathogens, toxin detection, pathogen identification and control methods, and the ecology and survival of pathogens in foods.

**108681 Seminar 1** 1(0-2-1)

Experience in the oral presentation in English of topics in food science and technology.

**108682 Seminar 2** 1(0-2-1)

Learning how to extract knowledge from research publications and articles on current topics relevant to food science and technology, how to undertake literature reviews, critical thinking and techniques, and practice in making of oral presentations in English.

**108683 Seminar 3** 1(0-2-1)

Methods to assist students in the presentation of a research progress report and discussion and suggestions regarding academic work and research in English.

**108684 Selected Topics in Food Science and Technology 3(2-3-5)**

A study of specific current topics of interest that relate to knowledge, research, and innovation in food science and technology.

**108691 Dissertation 4, Option 1.2 9 Credits**

Designing and conducting experiments, collecting and analysing data, and submitting a progress report to the dissertation advisor.

**108692 Dissertation 5, Option 1.2 9 Credits**

Designing and conducting experiments, collecting and analysing data, and submitting a summary progress report during the first half of the experiments to the dissertation advisor.

**108693 Dissertation 6, Option 1.2 9 Credits**

Finalising experiments, collecting and analysing data, and preparing and submitting a final progress report to the dissertation advisor.

**108694 Dissertation 7, Option 1.2 9 Credits**

Finalising experiments, collecting and analysing data, and preparing and submitting a final progress report to the dissertation advisor.

**108695 Dissertation 8, Option 1.2 9 Credits**

Preparing a dissertation, taking a final dissertation defense, and making any necessary rectifications or modifications before submitting a completed dissertation to the Graduate School.

**108696 Dissertation 1, Option 2.1 3 Credits**

Conducting an extensive literature review of topics related to the proposed research, preparing a draft research proposal which includes a research topic, the research problem statement, research objectives, justification for the research, and research procedures in brief, and submitting the proposal to the dissertation advisor.



**108697 Dissertation 2, Option 2.1****6 Credits**

Preparing and submitting a completed dissertation proposal comprising details of the research components, nominating a prospective dissertation advisor to the Graduate School, taking a dissertation defense, and submitting a progress report to the dissertation advisor.

**108698 Dissertation 3, Option 2.1****6 Credits**

Preparing and submitting a completed dissertation proposal comprising details of the research components, nominating a prospective dissertation advisor to the Graduate School, taking a dissertation defense, and submitting a progress report to the dissertation advisor.

**108699 Dissertation 4, Option 2.1****9 Credits**

Conducting experiments, collecting and analysing additional data, and submitting a progress report to the dissertation advisor.

**108701 Dissertation 5, Option 2.1****9 Credits**

Finalising experiments, collecting and analysing data, and preparing and submitting a final progress report to the dissertation advisor.

**108702 Dissertation 6, Option 2.1****6 Credits**

Preparing a dissertation, taking a final dissertation defense, and making any necessary rectifications or modifications before submitting a completed dissertation to the Graduate School.

**108703 Dissertation 1, Option 2.2****3 Credits**

Consulting and discussing the proposed research concepts with the dissertation advisor; researching related documents, books, academic journals, and research articles; and preparing and submitting a brief literature review to the dissertation advisor.

**108704 Dissertation 2, Option 2.2****6 Credits**

Conducting an extensive literature review of topics related to the proposed research; preparing a draft research proposal which includes a research topic, the research problem statement, research objectives, justification for the research, and research procedures in brief; and submitting the proposal to the dissertation advisor.

**108705 Dissertation 3, Option 2.2****6 Credits**

Preparing and submitting a completed research proposal comprising details of the research components, nominating a prospective dissertation advisor to the Graduate School, and taking a dissertation defense.

**108706 Dissertation 4, Option 2.2****9 Credits**

Designing and conducting experiments, collecting and analysing data, and submitting a progress report to the dissertation advisor.

**108707 Dissertation 5, Option 2.2****9 Credits**

Designing and conducting experiments, collecting and analysing additional data, and submitting a progress report to the dissertation advisor.

**108708 Dissertation 6, Option 2.2****9 Credits**

Finalising experiments, collecting and analysing data, and preparing and submitting a final progress report to the dissertation advisor.

**108709 Dissertation 7, Option 2.2****6 Credits**

Preparing a dissertation, taking a final dissertation defense, and making any necessary rectifications or modifications before submitting the completed dissertation to the Graduate School.