Course Detail

Master of Science Program in Innovative Food Science and Technology

Course Title: Master of Science Program in Innovative Food Science and Technology

Master Degree: Master of Science (Innovative Food Science and Technology)

Academic Institution: School of Agro-Industry, Mae Fah Luang University

Duration: 2 years (August 2022 – May 2024)

Background and Rationale:

Agricultural and food industry is the basic source of the food supply of all the countries in the world. The demand for food is increasing at a fast rate, therefore, it is one of the important industries in the world and especially in Thailand. The prosperity of this industrial sector contributed considerably to fostering the economic advancement of the countries. It engenders income for the population who work in the relevant parts of the supply chain. Thailand aims to be the center of food production in ASEAN and has a gross food product of 1.42 trillion Baht or an increase of 4% per year. Currently, the total economic value of the food processing industry is more than 5 trillion baht each year. In 2019, Thailand was the 11th largest food exporter in the world. Throughout our history we can trace back development and research for better food supply, management, and safety as the world population has risen while our access to resources remains the same or in some areas has even decreased. In recent years, the world has witnessed a global food crisis which creates a knock-on effect on people, society, and the environment. Being aware of the importance of the issues, the United Nations has announced Sustainable Development Goal 2: to "end hunger, achieve food security, improve nutrition and promote sustainable agriculture", all of this reflects well how the agricultural and food industry is a prerequisite for people's wellbeing. Therefore, promoting research and development that requires knowledge in food science and technology will not only ensure food security but more importantly will drive the agricultural and food industry in Thailand to become a global market leader in the future.

Surrounded by flourishing agricultural communities, Mae Fah Luang University takes an active role in the agro-industry with pride. The Master of Science Program in Innovative Food Science and Technology focuses on applying basic scientific knowledge to strengthen the agricultural and food industry of the country through research, development, and innovation. Therefore, the curriculum has been designed and developed according to the constructivist educational approach where knowledge and skills of learners will be developed from within the learner through real practices. Therefore, the Master of Science program in Innovative Food Science and Technology aims to create and develop human resources in the agricultural and food industry with professional morals and ethics. Students can apply the knowledge to solve problems in industry or work with others to further develop the agricultural and food industry.

The Master of Science Program in Innovative Food Science and Technology provides you with an understanding of modern food production and prepares you to work in various aspects of food research and development. A wide range of learning environments is available to students, including lectures (small degree programs with an excellent student-teacher ratio), tutorials, modern laboratory, and pilot plant practicals, factory visits, visiting scholars, and academic activities. This degree has strong links to Thailand's food industry leaders. With input from industry partners, you'll create new products, develop manufacturing processes, or design foods of the future with a focus on taste, health, sustainability, food quality, and food safety. Lecturers are active researchers who'll share the latest knowledge in food safety and quality management, food chemistry, food microbiology, functional food and nutrition, food processing technology,

food product development, future food, and Geographical Indications (GI) products. In order to further expand and improve successful ongoing research projects as well as to create sustainable synergies, the program is engaged in successful and intense cooperation with excellent partners in both the national and global academic realm, including; Chiba University, Shinshu University, Tokyo University of Marine Science and Technology, Kagoshima University, Japan; Korea University, Sejong University, Kyungnam University, Korea, Bogor Agricultural University, Indonesia; Universiti Teknologi Mara, Malaysia; Universiti Putra Malaysia, Malaysia; Hohenheim University, Germany; Mendel University in Brno, Czech Republic, and IUT Lyon 1 - site de Bourg en Bresse, AgroSup Dijon, France.

Objectives:

The aims of this program are to educate the students to have the knowledge, expertise, and potency in food science and technology; and to be able to apply their skills and advanced knowledge to a food-related workplace situation, as well as create knowledge, innovation, research and development of food products to the global challenges associated with feeding the world by contributing to meet the provision of high-quality, safe and nutritionally valuable food and food products; and be able to work with others in a multicultural society, realize morality, ethics, and professional ethics.

Course Synopsis and Methodology:

1. Study plan

Study Plan for Master of Science (Innovative Food Science and Technology) for Academic Year 2022

Plan A1 (Research only)

Year 1					
Semester 1 (Aug-Dec, 2022)			Semester 2 (Jan-May, 2023)		
Course code	Course title	Credit	Course code	Course title	Credit
1403798	Thesis	6 (0-18-6)	1403794	Seminar 1	0 (1-0-2)
			1403798	Thesis	12 (0-36-12)
Total (credits)		6	Total (credits)		12

Year 2					
Semester 1 (Aug-Dec, 2023)			Semester 2 (Jan-May, 2024)		
Course code	Course title	Credit	Course code	Course title	Credit
1403798	Thesis	12 (0-36-12)	1403798	Thesis	6 (0-18-6)
1403896	Seminar 2	0 (1-0-2)			
Total (credits)		12	Total (credits)		6

** Submit and present thesis proposal within Dec, 2022 and start conducting research from Jan, 2023 to April, 2024. Defend thesis within May, 2024*

Plan A2 (Course works and research)

Year 1					
Semester 1 (Aug-Dec, 2022)			Semester 2 (Jan-May, 2023)		
Course code	Course title	Credit	Course code	Course title	Credit
1401704	Advanced Statistics and Experimental Design for Agro-Industry	3 (3-0-6)	1403799	Thesis	3 (0-9-3)
1401705	Research Methodology for Agro-Industry	3 (3-0-6)	140xxxx	Elective 1	3 (x-x-x)
1402813	Advanced Food Analytical Techniques	3 (2-3-5)	140xxxx	Elective 2	3 (x-x-x)
1403801	Emerging Food Processing Technologies	3 (3-0-6)	140xxxx	Elective 3	3 (x-x-x)
1403794	Seminar 1	0 (1-0-2)			
Total (credits)		12	Total (credits)		12

Year 2					
Semester 1 (Aug-Dec, 2023)			Semester 2 (Jan-May, 2024)		
Course code	Course title	Credit	Course code	Course title	Credit
1403799	Thesis	6 (0-18-6)	1403799	Thesis	3 (0-9-3)
1403896	Seminar 2	0 (1-0-2)			
140xxxx	Elective 4	3 (x-x-x)			
Total (credits)		9	Total (credits)		3

** Submit and present thesis proposal within May, 2023 and start conducting research from June, 2023 to April, 2024. Defend thesis within May, 2024.*

Plan B (Course works and research by independent study)

Year 1					
Semester 1 (Aug-Dec, 2022)			Semester 2 (Jan-May, 2023)		
Course code	Course title	Credit	Course code	Course title	Credit
1401704	Advanced Statistics and Experimental Design for Agro-Industry	3 (3-0-6)	140xxxx	Elective 3	3 (x-x-x)
1403801	Research Methodology for Agro-Industry	3 (3-0-6)	140xxxx	Elective 4	3 (x-x-x)
1403794	Seminar 1	0 (1-0-2)	140xxxx	Elective 5	3 (x-x-x)
140xxxx	Elective 1	3 (x-x-x)	140xxxx	Elective 6	3 (x-x-x)
140xxxx	Elective 2	3 (x-x-x)			
Total (credits)		12	Total (credits)		12

Year 2					
Semester 1 (Aug-Dec, 2023)			Semester 2 (Jan-May, 2024)		
Course code	Course title	Credit	Course code	Course title	Credit
1402813	Advanced Food Analytical Techniques	3 (3-0-6)	1403898	Independent Study in Food Science and Technology	6 (0-18-18)
1403801	Emerging Food Processing Technologies	3 (2-3-5)			
1403896	Seminar 2	0 (1-0-2)			
Total (credits)		6	Total (credits)		6

2. Course Content

1) Thesis

1403799 Thesis 12 (0-36-12)
Research on a food science and technology topic pertinent to individual interest under the supervision and approval of advisory committee; research progress presentation every semester of the thesis enrollment; thesis defense; thesis submission; thesis or part of the thesis published in an academic conference proceeding or accepted for publication in an academic journal with peer review.

1403898 Independent Study in Food Science and Technology 6 (0-18-18)
Independent study on an approved food science and technology related topic pertinent to individual interest under the supervision and approval of advisory committee; research defense and submit after completion; prepare research output for publishing in the proceedings format of national/international conference and/or manuscript for peer review national/international journal publication.

2) Core courses

1401704 Advanced Statistics and Experimental Design for Agro-Industry 3 (3-0-6)
Principles of experimental design and statistical analysis for Agro-Industry; techniques in experimental design including completely randomized design (CRD), randomized complete block design (RCBD), factorial design, fractional factorial design, Latin square design, split plot design, and balance incomplete block design (BIB); multiple linear regression, discrete model regression, multivariate analysis, principal component analysis, and cluster analysis.

1401705 Research Methodology for Agro-Industry 3 (3-0-6)
Concepts and approaches for research project for food industry; research ethics; planning and management of the research project; research process and techniques; industrial problem-based proposal development; data collection, analysis and assessment; intellectual property management; report and article writing for publication; technology transfer to manufacturers; review and evaluate innovation and advance for food industry; presentation and report submission.

1403801 Emerging Food Processing Technologies 3 (3-0-6)
Principles of recently developed food processing including thermal processes e.g. ohmic heating, radio frequency, infrared frequency, pressure assisted temperature sterilization and microwave assisted thermal sterilization; non-thermal processes e.g. high pressure processing, cold plasma, pulse electrical fields, electron beam, membrane separation, supercritical fluid extraction, aseptic system; automatic control and artificial intelligence for food industry; industrial visit.

1402813 Advanced Food Analytical Techniques 3 (2-3-5)
Theory and advanced concept of food analysis by modern analytical techniques; electrochemistry; biosensor; spectrophotometry, Fourier transform infrared, near infrared, UV-visible, atomic spectrophotometry, inductively couple plasma; mass spectrometry; chromatography, liquid chromatography, gas chromatography; hyphenated techniques; comprehensive chromatography, recent and trends of modern analytical techniques.

1403794 Seminar 1 0 (1-0-2)
Study and selection of currently interesting research issues in food science and technology or related area; scientific data searching; oral presentation; report submission.

1403896 Seminar 2 0 (1-0-2)
Literature search, discussion and thesis progress presentation.

3) Elective courses can be divided into 3 groups of subjects. Student can choose.

3.1) Food Industrial Technology and Innovation

1403701 Food Industrial Research Project 6 (0-18-6)
Study, analyze, and find the source of problems in agri-food business; literature review for designing an experiment; solve the problems related to food science and technology under guidance of the student's advisor; equivalent of a 6-credit laboratory subject workload for all activities.

1403702 Professional Experience in Agro-Industry 3 (0-9-3)
Experienced in a food factory, government sector or other organizations related to agro-industry for at least 1 year; a written report and oral presentation to the committee on the topic related to students' knowledge and experiences.

1403703 Advanced Professional Experience in Agro-Industry 6 (0-18-6)
Experienced in a food factory, government sector or other organizations related to agro-industry for at least 3 years; a written report and oral presentation to the committee on the topic related to students' knowledge and experiences.

1403704 Big Data Analytics for Agro-Industry 3 (3-0-6)
Big data definition; collection of big data; data storage analysis; data visualization; application of big data in food safety; application of big data in food processing and engineering; application of big data in food product development and marketing.

1403705 Project Management Professional for Agro-Industry 3 (3-0-6)
Project initiation and planning; plan and define project scope; validate and control scope; define and sequence activities; develop the project schedule; creating a project budget; planning quality management; quality methodologies and standards for project management; plan and acquire resources; plan and manage communications; monitor project communications; project risk analysis; planning stakeholder; managing stakeholder engagement.

1406702 Food Business Management 3 (3-0-6)
Supply chain and logistic management in food business; consumer insight and analytics; food business model development and creativity; business model canvas; strategic marketing management; cost structure and strategy management; global food business trade and retail marketing management; business pitching strategy; entrepreneurship and food business startup; e-commerce.

1405701 Quality Control Design in Food Industry 3 (3-0-6)
Overview of food quality; concepts of quality management systems; quality control; quality design; quality policy and business strategy; quality audit; quality cost; patterns of quality control and management in food industry; trends in food quality control.

1405702 Food Safety and Standards for Global Market 3 (3-0-6)
General and global food standards; standards related with export and import food products; Free Trade Area (FTA); food safety and standard trends, The Global Food Safety Initiative (GFSI), The Safe Quality Food (SQF), Global Aquaculture Alliance Seafood Processing, Global Red Meat Standard (GRMS), Japan Food Safety Management Association (JFSM), etc.

1403706 Valorization of Food Processing By-products 3 (3-0-6)
The most recent advances in the field of food processing by-products; the urgent need for sustainability within the food industry; wastes in food sector and how to minimize; the handling and management of by-products; waste and by-products valorization; value added ingredients recovered from by-products; the success stories and solutions of different food processing by-products utilization as food and feed ingredients; regulatory issues and concerns of valorization of food processing by-products.

1403795 Advanced Food Product Innovation 3 (2-3-5)
Consumer concept for food product development; accelerating food product design and development; new tools for food product development; appropriate design strategy; optimizing new food product design, design quality in food product development process; business plan.

1404760 Shelf Life Prediction of Food Products 3 (2-3-5)
Quality of food and shelf life stability; quality tests; factors affecting shelf life of food products; diffusion theory of particles; role of water activity and accelerated food shelf life testing techniques; sorption isotherm; reaction kinetics occurring in foods; testing and prediction of product shelf life using mathematical models.

1404761 Innovations in Food Packaging 3 (2-3-5)
New technologies in food packaging; mass transfer of gas and solute through packaging materials; quality of packed foods; active packaging research and development; smart packaging technologies; edible and biodegradable coating and films; commercial aspects of new packaging technologies.

1406770 Consumer Trends and Technology 3 (3-0-6)
Principles of consumer science; consumer behavioral models; consumer perception, learning, memory, motivation, and attitude; consumer decision making process and group influence; effect of income, social class, subculture and culture on consumption; methods of data collection; application of qualitative, quantitative and mixed method for designing and planning of consumer data collection; use of consumer questionnaires; consumer study design; case study for food industry.

1403707 Tea Science and Innovation 3 (2-3-5)
Tea processing, tea biochemistry and analysis, tea and health benefit, tea flavor, tea brewing, tea tasting, tea extract process, tea extract innovation and its application.

1403708 Coffee Technology 3 (2-3-5)
History of coffee; types and coffee variety; coffee planting and farm management; primary coffee processing; secondary coffee processing; roasting; brewing; storage and packaging; flavor profile and cupping; coffee chemistry; quality control and analysis; global trends and marketing; emerging technology and current issues.

1403709 Economical Northern Fruits and Vegetables Technology 3 (2-3-5)
Important economical Northern fruits and vegetables in Thailand, garlic, potato, onion, shallot, longan, pomelo, tangerine, pineapple; production situation; consumption trends; problems and obstacles in the global market; important postharvest technology, current and novel technology; related quality systems and standards; principles of logistics management; case studies in the production and processing; industrial visit.

1403710 Future Foods 3 (3-0-6)
Future trends in food consumption; innovative food formulations (synthetic food, genetic engineering, 3D food printing, biotechnology approaches); alternative protein source (plant-, insect- and cell-based protein); food for specific needs; brain and beauty foods; regulation for novel foods; challenges of food science and technology in future foods.

1403719 Nanotechnology in Food 3 (3-0-6)
The fundamentals of nanotechnology from historical development; concepts and principles to nanomaterial; property characterization; the application of nanotechnology in food.

1406759 Perception and the Chemical Senses of Food Products 3 (3-0-6)
Anatomy, physiology, psychophysics and genetics of the chemical senses related to food perception; relation between the chemical senses and food intake; chemical senses in special populations (infants, children, elderly, athletes and clinical populations).

1403720 Starch and Hydrocolloids in Designing Food Products 3 (2-3-5)
Role of starch and hydrocolloids in designing food products; functionality and molecular structure of starch and hydrocolloids; interactions of starch and hydrocolloids in food systems; structure-function relationship of starch and hydrocolloids in food products; modification of food properties using starch and hydrocolloids; factors influencing properties of starch-hydrocolloids blended systems; starch and hydrocolloids applications in designing the desirable food product properties.

1402703 Trends in Food Science and Technology 3 (3-0-6)
Review and evaluate critical current issues in food science and technology; presentation, discussion and report submission.

1402702 Principles of Food Science and Technology 3 (3-0-6)
Introduction; principles in food chemistry, food microbiology, food engineering and food processing; related issues in food science and technology; case studies.

1403721 Global Food Industry 3 (3-0-6)
Food industry overview; important food industry sectors (cereal and bakery, meats, fish, poultry, fruits and vegetables, sugars and other sweets, non-alcoholic and alcoholic beverages, fats and oils and dairy products); world leaders in food industry; current situation and trends in food industry; industrial visit.

1409701 Agricultural Logistics Management 3 (3-0-6)
Agricultural supply chain; agricultural forecasting; crop planning and scheduling; warehousing and inventory management for perishable products; transportation management and material handling systems; partnership systems in the agricultural supply chain; information management in the agricultural supply chain.

3.2) Food Chemistry and Nutrition

1402732 Chemistry of Food Macronutrients 3 (2-3-5)
Composition, structures, reactions and functional properties of proteins, carbohydrates and lipids in food systems; analytical techniques, isolating, identifying, quantifying of these compositions; mechanisms of the effect of processing and storage conditions on the properties of proteins, carbohydrates and lipids; interactions among these components in foods; roles on interactions on food stabilization; related current technology.

1402814 Functional Foods and Nutraceuticals 3 (3-0-6)
Definition and classification of functional foods and nutraceuticals; sources, and health benefits of bioactive components; nutraceutical extraction and isolation; impact of processing on the bioavailability of functional and nutraceutical ingredients in foods; novel technology to retain activity in the food; development and marketing of functional foods; efficacy and safety of functional foods and nutraceuticals; functional foods and nutraceuticals regulations.

1402815 Applied Food Proteins Chemistry 3 (2-3-5)
Food proteins; amino acids, peptides, and proteins; physical, chemical and processing-induced changes in proteins; functional properties of food proteins; biologically active peptides from food proteins; protein and peptide-based antioxidants; nutraceutical aspects of food proteins.

1402704 Alternative Protein Food 3 (2-3-5)
Overview of food proteins; alternative protein sources; the issue of protein fractionation and isolation; technofunctionality and application scenarios; mimicking fat systems, texture and mouthfeel; nutritional aspects; the consumer view and adoption behavior; current status and future trends of alternative protein food.

1402705 Dietary Phytochemicals and Chemopreventive Role 3 (3-0-6)
Phytochemicals in food; bioaccessibility and bioavailability of phytochemicals; carcinogenesis; cancer chemoprevention mechanisms (in vitro and in vivo study); chemopreventive role of phytochemicals; drug interaction; current research of dietary phytochemicals.

1402706 Metabolomics in Food Research 3 (2-3-5)
GC/MS-, LC/MS- and NMR- based metabolomics; Experimental design; sample preparation; data acquisition; pre-processing; metabolite analysis; chemometrics; practical laboratory on plants and microbial metabolite analysis.

1402707 Lifecycle, Nutrigenetics and Personalized Nutrition 3 (3-0-6)
Nutrition throughout the life cycle; introduction of nutrigenetics; the effects of nutrients on genome, proteome and metabolome; the relation between the genetic factors and disease development such as chronic-degenerative, osteoporosis, neurological, obesity, insulin resistance and cardiovascular disease; the role of lifestyle factors in various chronic diseases, including cancer, bone disease, obesity and diabetes; personalized nutrition; current issues.

1402708 Food Structures, Digestion and Health 3 (2-3-5)
Food structures in natural and processed foods and their behavior during processing; impact of food structures and matrices on nutrient uptake and bioavailability; modelling of the gastrointestinal tract; food development to meet the modern challenges of human health.

Graduation Conditions:

- Complete all required courses
- Thesis oral defense
- Thesis submission
- English language: MFU-TEP 65 / TOEFL (IBT) 72 / TOEFL (ITP) 543 / IELTS 6 or English score from other sources (see the MFU announcement)
- Publication (s): Journal (with peer review) or Proceedings in the International Conference or Patent

Applicant Qualifications:
Students with a bachelor's degree in Food Science, Biology, Chemistry, Biochemistry, Nutrition, Biotechnology, Agricultural and related fields with cumulative undergraduate GPA ≥2.5 and TOFEL score ≥450 are encouraged to join the program. The program admissions committee makes all admission considerations on a case-by-case basis.

Document Required:

- Application affixed with photographs;
- A copy of transcript from attended institutions
- Evidence of English proficiency, TOEFL exam or others
- Statement of purpose
- Letters of recommendation from referee
- A copy of passport

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***The application procedure will complete when TICA has received the hard copy of the application form and other related documents through the Royal Thai Embassy/Permanent Mission of Thailand to the United Nations/Royal Thai Consulate – General accredited to eligible countries/territories.