

## Course Detail

### Master of Science Program in Postharvest Technology and Innovation

#### (M.Sc. Postharvest Technology and Innovation)

**Master Degree:** Master of Science (Postharvest Technology and Innovation)

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

**Duration:** 2 academic years (24 August 2020 – August 2022)

**Background and Rational:**

Postharvest losses refer to measurable quantity and quality loss of food crops at harvest, storage, transportation, processing, marketing and preparation before consumption. It occurs throughout the value chain, as a result of technical and managerial setbacks during harvest, handling, transportation, processing, packaging, marketing, and distribution. On the other hand, investment efforts made to save food after harvest usually cost less and are less harmful to the environment. A minimum postharvest losses reduction can potentially reduce production cost. Postharvest losses impact on environment and climate following unnecessary emissions of greenhouse gases produced during production, processing, and transportation of fruits and vegetable which ultimately end into loss. Postharvest Technology and Innovation program aims to transfer the knowledge and innovation to all students who may use that knowledge for improving income and nutrition status of households, food security, and qualities of agricultural products in the supply chain. Application of postharvest technology and innovation on horticultural crops is an important effort for improving food and nutrition security and raised income in many countries.

The school of Agro-Industry has been established to focus the studies and research on increasing the value of agricultural produces throughout the whole chain. The lecturers in our school gain much experience from the research work and ready to transfer to the students. Examples of our major studies include postharvest technology for fruit, vegetables, ornamental, cereal grains and legumes; packaging development and application; quality and food safety management; logistics and supply chain management: and utilization of agricultural waste etc.,

**Objective:**

The aims of this Program are to educate the student to have knowledge, expertise, and potency in postharvest technology and innovation and to be able to apply this knowledge for prolonging shelf life of agricultural produce, reducing of postharvest losses, driving economy and development of country, and enhancing the national and international competitiveness.

**Course Synopsis and Methodology:**

Course features both theoretical and practical learning which is divided into 3 groups: core courses, elective courses in 4 subgroups (Postharvest Technology and Innovation, Food Science and Technology, Agricultural Technology, and Management), and Thesis/Independent Study.

**Course Content/Study Topic:****Study Plan for M.Sc. Postharvest Technology and Innovation for Academic Year 2020****Plan A1 (Research only)**

Year 1					
Semester 1 (Aug-Dec, 2020)			Semester 2 (Jan-May, 2021)		
1407891	Thesis	6	1407891	Thesis	12
			1407748	Seminar 1	0
	Total (credits)	6		Total (credits)	12

Year 2					
Semester 1(Aug-Dec, 2021)			Semester 2 (Jan-May, 2022)		
1407891	Thesis	12	1407891	Thesis	6
1407846	Seminar 2	0			
	Total (credits)	12		Total (credits)	6

*\* Submit and present thesis proposal within Dec, 2020 and start conducting research from Jan, 2021 to April, 2022. Defend thesis within May, 2022*

**Plan A2 (Course works and research)**

Year 1					
Semester 1 (Aug-Dec, 2020)			Semester 2 (Jan-May, 2021)		
1407700	Agricultural Research Methodology	3	1407753	Postharvest Technology and Innovation	3
1407738	Postharvest Biology of Plant	3	1407749	Seminar 1	1
140xxxx	Elective 1	1	140xxxx	Elective 3	3
1407731	Advanced Instruments for Postharvest Quality Determination	3	140xxxx	Elective 4	3
140xxxx	Elective 2	3	1407892	Thesis	3
	Total (credits)	13		Total (credits)	13

Year 2					
Semester 1 (Aug-Dec, 2020)			Semester 2 (Aug-Dec, 2020)		
1407847	Seminar 2	1	1407892	Thesis	3
1407892	Thesis	6			
	Total (credits)	10		Total (credits)	3

*\* Submit and present thesis proposal within May, 2021 and start conducting research from June, 2021 to April, 2022. Defend thesis within May, 2022.*

**Plan B** (Course works and research by independent study)

Year 1					
Semester 1			Semester 2		
1407700	Agricultural Research Methodology	3	1407753	Postharvest Technology and Innovation	3
1407738	Postharvest Biology of Plant	3	1407749	Seminar 1	1
140xxxx	Elective 1	1	140xxxx	Elective 4	3
140xxxx	Elective 2	3	140xxxx	Elective 5	3
140xxxx	Elective 3	3	1407752	Farm and Industrial Visit	1
	Total (credits)	13		Total (credits)	11

Year 2					
Semester 1			Semester 2		
1407847	Seminar 2	1	1407896	Independent Study	6
1407755	Internship	5			
	Total (credits)	6		Total (credits)	6

**Courses****1. Core courses**

1407700	Agricultural Research Methodology	3(3-0-6)
1407738	Postharvest Biology of Plant	3(2-3-5)
1407753	Postharvest Technology and Innovation	3(2-3-5)
1407748	Seminar 1	0(0-3-1)
1407846	Seminar 2	0(0-3-1)
1407749	Seminar 1	1(0-3-1)
1407847	Seminar 2	1(0-3-1)
1407731	Advanced Instruments for Postharvest Quality Determination	3(2-3-5)

**2. Elective courses can be divided into 3 groups of subjects. Student can choose.****2.1) Postharvest Technology and Innovation**

14057xx	Quality and Food Safety Management	3(3-0-6)
1407734	Postharvest Diseases	3(2-3-5)
1408703	Packaging Innovation	3(2-3-5)
1407744	Postharvest Management of Fruits and Vegetables	3(2-3-5)
1407733	Postharvest Management of Cereal Grains, Legumes and Oilseeds	3(2-3-5)
1407746	Postharvest Technology of Ornamental Crops	3(2-3-5)
1407761	Non-destructive Evaluation for Agricultural Crops	3(2-3-5)
1407848	Postharvest Pest Management	3(3-0-6)
1407732	Postharvest Engineering	3(2-3-5)
1407735	Selected Topics in Postharvest Technology and Innovation	1(1-0-2)
1408704	Packaging for Transport and Distribution	3(2-3-5)
1409701	Agricultural Logistics Management	3(3-0-6)
1407755	Internship	5(0-40-6)
1407752	Farm and Industry Visit	1(0-6-1)
1407756	Agri-Business Management	3(3-0-6)

**2.2) Food Science and Technology**

1403746	Food Processing Innovation	3(2-3-5)
1406770	Consumer Trends and Technology	3(3-0-6)
1402814	Functional Foods and Nutraceuticals	3(3-0-6)

**2.3) Agricultural Technology**

1407701	Principle of Horticulture	3(3-0-6)
1407702	Agricultural and Environmental Science	3(3-0-6)
1407703	Principle of Floriculture	3(3-0-6)
1407704	Crop Technology and Innovation	3(3-0-6)

**2.4) Management**

1202701	Economic Analysis for Global Business Management	3(2-3-5)
1203721	Marketing Management	3(3-0-6)
1203707	Financial and Accounting Management	3(3-0-6)
1209731	Logistics and Supply Chain Analytics	3(3-0-6)
1209732	Inventory and Distribution Management	3(3-0-6)

**3. Thesis**

1407891	Thesis	36(0-108-36)
1407892	Thesis	12(0-36-12)
1407896	Independent Study	6 (0-18-6)

**1. Core courses****1407700 Agricultural Research Methodology 3(3-0-6)**

Principles of agricultural research; research methodology for postharvest technology; database on scientific research: research ethics; citation management; research reading and interpretation of research data; research planning and management; conceptual framework; research design; data collecting and statistical analysis of data; data explanation, literature review; writing a research report.

**1407738 Postharvest Biology of Plant 3(3-0-6)**

Nature and structure of harvested product; metabolic processes, respiration and water losses of harvested products; ethylene and other plant hormones; quality and maturity; pre- and postharvest factors affecting fruit and vegetable quality; physiological and biological changes during storage; biological and environmental factors influencing deterioration; plant senescence.

**1407753 Postharvest Technology and Innovation 3(2-3-5)**

Postharvest losses of field crops and perishable crops; quality safety and standard; maturity indices; harvesting technology; cooling; postharvest treatment; storage and controlled atmosphere; packaging technology; cool chain management; transport and distribution; postharvest technology and innovation; eco-friendly technology.

**1407748 Seminar 1 0(0-3-1)**

Literature search and preparation; presentation and discussion; writing academic report.

- 1407846 Seminar 2 0(0-3-1)**  
Academic presentation and discussion on current interests; progressive report on thesis research.
- 1407749 Seminar 1 1(0-3-1)**  
Literature search and preparation; presentation and discussion; writing academic report.
- 1407847 Seminar 2 1(0-3-1)**  
Academic presentation and discussion on current interests; progressive report on thesis research.
- 1407731 Advanced Instruments for Postharvest Quality Determination 3(2-3-5)**  
Advanced techniques and analytical instruments for evaluations of physical, chemical and microbial qualities in commodities, e.g, color and texture measurement, microstructure analysis, thermal property determination, spectroscopy, chromatography and non-destructive analysis.

## **2. Elective courses can be divided into 3 groups of subjects. Student can choose.**

### **2.1) Postharvest Technology and Innovation**

- 1405744 Quality and Food Safety Management 3(3-0-6)**  
Scientific basis for food regulations; national and international food regulations; quality and grade standard; statistical process control; quality assurance; total quality management; quality system in Agro-Industry; GAP, organic agricultural standard; GMP, HACCP, ISO series; implementation of food safety program and auditing; current issues in food safety
- 1407734 Postharvest Diseases 3(2-3-5)**  
Significance; postharvest losses due to biotic and abiotic stresses; postharvest disease initiation and factors affecting postharvest disease development; physiological and biochemical changes following infection; attack mechanisms of the pathogen; defense mechanisms in plant against the pathogen; control of postharvest diseases: cultural, physical, biological and chemical disease suppression practices; integrated approach for controlling postharvest diseases; postharvest diseases of economic commodities.
- 1408703 Packaging Innovation 3(2-3-5)**  
Active, smart and intelligent packaging; innovation of packing and packaging materials; sustainable packaging.
- 1407744 Postharvest Management of Fruits and Vegetables 3(2-3-5)**  
Importance of economic fruits and vegetables; harvesting; quality and food safety management; packing house operation; packaging system; transport and distribution; tracking and traceability; value added products of fruits and vegetables; current issues.

**1407733 Postharvest Management of Cereal Grains, Legumes and Oilseeds 3(2-3-5)**

Economic cereal grains, legumes and oilseeds; physiology, structure, composition, and characteristics of grains and seeds; quality and safety standard; pre-harvest management; harvesting practice; postharvest losses; postharvest management; storage; utilization; advances in postharvest technology; current issues.

**1407746 Postharvest Technology of Ornamental Crops 3(2-3-5)**

Postharvest physiology and biochemistry; postharvest management of cut flowers and cut foliages; post-production management of potted ornamentals; treatments for improving quality and the longevity of cut flowers; packing house operation and packaging systems; commercial ornamental productions; current issues and application.

**1407761 Non-destructive Evaluation for Agricultural Crops 3(2-3-5)**

Conventional methods for produce evaluation; theory and principle of non-destructive evaluation; near infrared spectroscopy (NIR); magnetic resonance imaging (MRI); computerized tomography (CT); electrical impedance spectroscopy (EIS); acoustic technique; image analysis and machine vision system; applications for produce quality attributes evaluation.

**1407848 Postharvest Pest Management 3(3-0-6)**

Importance of postharvest pests; crop loss assessment; outbreak forecasting and management decision; cultural, physical, biological and chemical approaches for postharvest pest management; postharvest integrated pest management.

**1407732 Postharvest Engineering 3(2-3-5)**

Principles of postharvest engineering; physical and engineering properties of produce; grading and sorting system; thermal and non-thermal processes; cold-storage systems; design of systems and facilities; current issues and trends in postharvest engineering.

**1407735 Selected Topics in Postharvest Technology and Innovation 1(1-0-2)**

Discussion and lectures on special aspects or advanced topics in postharvest technology and innovation of produce.

**1408704 Packaging for Transport and Distribution 3(2-3-5)**

Packaging types and systems for transport and distribution; shock; vibration; compression; cushion; palletization; packaging pre-shipment testing; packaging technology for transport and distribution.

**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.

**1407756\* Agri-business Management 3(3-0-6)**

Agribusiness practices; economics of agriculture; farm finance; international trade; supply chain management; creation of value-added products for domestic and international markets; problems and prospects.

**1407755\* Internship 5(0-40-6)**

National or international internship at the provided organization for specific period of time; report submission and oral presentation.

**1407752 Farm and Industry Visit 1(0-6-1)**

Field trips to farm, packing and processing factory, packaging industry, research institutes or organizations related to postharvest technology and innovation; oral presentation and report submission.

**2.2) Food Science and Technology****1403746 Food Processing Innovation 3(2-3-5)**

Overview of the current food processing technology; fundamental of the novel food processing technology; thermal and non-thermal food processing; the integrated processing technology; industrial application.

**1406770 Consumer Trends and Technology 3(3-0-6)**

Principles of consumer science; consumer behavioral models; consumer perception, learning and 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; design and set up consumer study experiments; case study for food industry.

**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.

**2.3) Agricultural Technology****1407701 Principle of Horticulture 3(3-0-6)**

Plant structure and morphology; growth and development of horticultural crops; plant propagation; soil and fertility; environmental factors; vegetable crops, fruit crops, ornamental crops; modern technology in horticulture.

**1407702      Agricultural and Environmental Science      3(3-0-6)**

Relationship of agriculture and environment; sustainable and the eco-friendly agriculture; agricultural waste management; agricultural innovations and technology for sustainable production.

**1407703      Principle of Floriculture      3(3-0-6)**

Introduction; propagation; temperature; light; water; nutrition; cultural media; plant growth regulation; pest management; postharvest management; greenhouse construction and operations; marketing and business management; current issues.

**1407704      Crop Technology and Innovation      3(3-0-6)**

Greenhouse design and technology; plant factory; soilless technology; smart farming; integrated pest technology; current issues.

**2.4) Management****1202701      Economic Analysis for Global Business Management      3(3-0-6)**

Concept of economics and its application and tools; role of economics in managerial decision making; risk analysis; demand analysis and estimation; production analysis and estimation; cost analysis; market structure analysis; pricing theory and practices; trade agreement and corporation in region; business trend forecasting and its effect on country; regional; and global level.

**1203721      Marketing Management      3(3-0-6)**

Marketing concepts including consumer behavior; communication and CRM in Digital age focus on the analytical decision-making tools in marketing: customer analysis; market segmentation; target market with positioning; demand forecast analysis; and competitive situational analysis to create a comprehensive strategies and online marketing program for a product and brand; concept of brand building; case studies.

**1203707      Financial and Accounting Management      3(3-0-6)**

Accounting concepts and financial reports; recording of accounting transactions; recognition of revenue; expenses; cost of goods sold and inventory; depreciation of fixed assets; liabilities and owners' equities; break-even analysis; projected profit and loss; projected cash flow; projected balance sheet; analysis of company financial reports; evaluation of business performance; case studies.

**1209731      Logistics and Supply Chain Analytics      3(3-0-6)**

Analytical techniques for managing logistics and supply chain management; customer services; procurements; distribution centers; inventories and customer demand; optimal routes; distribution centers and networks; safety logistics; related technology and information management for logistics system; techniques for adding value and lowering non-value added activities along logistics system; outsourcing logistics systems; performance measurement; bullwhip effect; other related topics.



**1209732            Inventory and Distribution Management            3(3-0-6)**

Managing inventories and distribution; determination distribution center locations; distribution design; distribution management by product types; roles of distribution center in inventory management as well as logistics and supply chain management; performance measurement in inventory and distribution management; technology and information management for managing inventories and distribution; customer demand and inventory management; other related issues.

**3. Thesis**

**1407891            Thesis            36(0-108-36)**

Research on postharvest technology and innovation of agricultural produce topic pertinent to individual interest under the supervision and approval of advisor and/or co-advisor; research progress; Thesis submission and presentation.

**1407892            Thesis            12(0-36-12)**

Research on postharvest technology and innovation of agricultural produce topic pertinent to individual interest under the supervision and approval of advisor and/or co-advisor; research progress; Thesis submission and presentation.

**1407896\*            Independent Study            6(0-18-6)**

Research in interest topic under the advice of an advising professor; research methodology, the formation of research tools; the statistic applied in the research; the data analysis and the data conclusion; report submission and presentation of Independent Study.

**Graduation Conditions:**

- Complete all required courses
- Thesis oral defense
- Thesis submission
- English language: 40 % MFU-TEP/English score from other sources (see the MFU announcement)
- Publication (s): *Journal (with peer review) or Proceedings in the International Conference or Patent*

**Applicant Qualification:**

Students with a bachelor's degree in Agriculture, Food Science, Biology, Chemistry, Biochemistry, Biotechnology, and related fields with cumulative undergraduate GPA 2.50 and TOFEL score 450 are encouraged to join the program. The program admissions committee makes all admission consideration on 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.