Course Syllabus
First Semester, Academic Year 2024

1. **Faculty of Agriculture at Kamphaeng Saen** **Department of Farm Mechatronics**
2. **Course code: 02027451** **Course name:** Post-Harvest Mechanization
   Credit: 3(2-3-6)

   Pre: *02027221 (Farm Engines I)*
3. **Instructor team:**

Dr. Sunattha Attisilwet E-mail : Sunattha.at@ku.th 0902356651
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4. **Providing students with access to and advice outside of class hours:**

Working days During official hours, except during teaching periods or when on official business outside of the premises. In case of emergency, students can contact us via Line group or Mobile phone.

5. **Course Objectives: Upon completing the course, students will be able to:**

5.1 Understand the nature of postharvest agricultural products.
5.2 Comprehend the operation and maintenance of postharvest machinery including cleaning, sorting, drying, milling, conveying, cooling, and packaging equipment.
5.3 Apply knowledge to appropriately preserve postharvest products based on product types.
5.4 Utilize postharvest technologies to ensure product quality, safety, and standards while reducing loss.
5.5 Develop a positive attitude toward the use of postharvest agricultural machinery with ethical awareness and consideration for consumers and environmental impact.

6. **Course Description:**

Natural of agricultural products, agricultural machinery for postharvest in operations of drying, milling, cleaning, sorting, cooling, storage, packaging, and handling processes.

6. **Program Learning Outcomes: PLOs (7 PLOs of the 2017 AMM revised curriculum)**

PLOs	Knowledge	Specific Skills	Generic Skills	Attitude
PLO2: Be able to analyze problems logically and systematically in agricultural machinery and technology. PLO5: Be shown to have morality, ethics, discipline, punctuality, honesty, responsibility towards oneself and society PLO7: Be able to work with	K1: Principle working Agricultural machinery for postharvest processes K2: Cooling technology and postharvest storage K3: Psychometric Chart K4: GMP for Packing House	S1: Be able to correctly explain operation and maintenance of postharvest equipment correctly according to the academic field. S2: Be able to explain the working principles of refrigeration for agricultural product. S3: Be able to explain the	G1: Understand postharvest machinery technical terms G2: Comply with course requirements 02027451 G3: Work collaboratively skill with others	A2: Awareness of using technology that is safe for consumers and environment (R) A2: Be aware of safety for yourself and others while operating. (V) A3: Responsibility in using and maintaining tools (V) A4: Be aware of having morality,

PLOs	Knowledge	Specific Skills	Generic Skills	Attitude
others as good leaders and members, and able to adapt to different situations appropriately.		relationship between refrigeration technology and post-harvest storage of produce.		ethics, honesty, and discipline. (V)

7. Course Learning Outcomes (CLOs) and Methods for measuring learning outcomes:

Course Learning Outcomes: CLOs	Methods for measuring learning outcomes
1. Able to explain the working principles of agricultural machinery used with agricultural products after harvesting correctly according to academic principles (U) 2. Able to apply the knowledge which gained to use with post-harvest technology correctly according to academic principles (Ap) 3. Able to search for information and present case studies of post-harvest technology innovations together with friends in the group. (Ap) 4. Be responsible, honest, and work with others (V)	1. Evaluate learning outcomes during the course/at the end of the lesson/midterm and final semester 2. Conduct experiments and make reports every time there is an experiment, allowing students to participate in the learning process 3. Responsibility and participation in lectures and experiments, as well as study tours 4. Evaluate teamwork skills using Scoring Rubrics 5. Individual and group reports to develop analytical thinking, communication and classroom presentation skills by selecting appropriate technology 6. The number of times attending classes is not less than 80 percent for both lectures and experiments

8. Academic achievement measurement

9.1 Students must attend both lectures and practical classes for at least 80 percent of the total class time.

9.2 Assessment criteria and academic achievement measurement

9.2.1 Lecture	End-of-Lesson Learning Assessment/Midterm Examination Final Exammination	15% 15%
9.2.2 Laboratory	Laboratory 1: Nature of Agricultural Products & Teamwork Laboratory 2: Sorting & Teamwork Laboratory 3: Drying & Teamwork Laboratory 4: Refrigeration and Storage & Teamwork Laboratory 5-7: Rice Milling & Teamwork	5% 10% 10% 5% 20%
9.2.3 Group case study report book* (5%), presentation slides and presentation (5%)		10%
9.2.4 Interest in Study, Attention in Lecture and Laboratory, Responsibility, Teamwork		10%
	Total	**100**

*Select the following topics: 1) Drying 2) Cold chain system 3) Rice milling 4) Logistics system 5) Use of technology in sorting/quality selection 6) Agricultural product washing process 7) Packing plant 8) Agricultural product sorting and packaging process

Score level	≥80%	75-79%	70-74%	65-69%	60-64%	55-59%	50-54%	<50%
Grade	A	B+	B	C+	C	D+	D	F

9. Document to read:

10.1 Jingtae Siripanich. 2006. Physiology and post-harvest technology of vegetables and fruits. 396 pages
10.2 Jingtae Siripanich. 2007. Post-harvest biology and plant science. 453 pages
10.3 Teaching materials 02027451 Post-harvest agriculture, various topics
10.4 Documents and articles on post-harvest technology on the internet, various academic journals

10. Evaluation of teaching results:

From the student's questionnaire, students must evaluate their teaching results at www.kps.ku.ac.th (go to Students, Teaching System) with the university's teaching evaluation form before the mid-term and final exams.

11. Review to improve teaching methods and teaching systems:

12. Review to improve teaching methods and teaching systems:

□ **No review because students**. …….

☑ Reviewed by reviewing from……..

□ Not revised……

☑ Revised to be consistent with Emphasize on learning to make learners more involved to create a Growth mindset by allowing students to choose their own friends to work in groups, study the work, plan the laboratory work, analyze, criticize and emphasize more reflection.

13. Teaching improvement from teaching evaluation results:

□ No teaching evaluation

☑ **Teaching evaluation,** The evaluation results were at a very good level, at (4.54%), with 48 evaluators out of a total of 54 students, or 88.89%.

☑**No improvement**, ……

□ Improvements as follows……..

14. Schedule of activities related to teaching and learning (see Table 1)

Lecture (700)	Room กว.2-7	Tuesday 9:00-12:00
Laboratory (711)	Room กว.2-7 Laboratory buildings inside and outside the department	Tuesday 14:00-17:00

Signature_____

(Dr. Sunattha Attisilwet)

24 June 2024

Table 1 Schedule of activities related to teaching and learning of the 02027451 Post - Harvest Mechanization

Week	Lesson	LLOs	L-Level	Teaching/Learning method	Assessment method	Instructor	CLOs	PLOs
1-2 (25 June, 2 July 24)	Introduction to the subject/operation principles and maintenance of rice milling equipment	LLO1(1): Able to explain the working principles and maintenance of rice milling equipment correctly according to academic principles.	U	1. Explain the course syllabus and listen to students' opinions on teaching methods and evaluation. 2. Lecture on the topic: Principles of operation and maintenance of rice milling equipment 4. Site visit a rice mill 5. Small-scale rice mill operations in small groups	1. Observe and evaluate student behavior in the classroom and during the rice mill study tour. 2. The laboratory report is a formative assessment of students by recording learning and Summative using Making schemes, emphasizing assessment from on-time submission of work and the quality of assigned work (if any). 3. During the group laboratory, students evaluate their friends in the group using Scoring Rubrics. 4. End-of-chapter lecture/mid-term examination. Students attend both lectures and laboratory on time.	Chiti, Thawatchai , Sunatha	CLO1 , CLO4	PLO2 , PLO5
		LLO2(2): Able to apply knowledge about the nature of agricultural products after harvesting to rice milling equipment correctly according to academic principles.	Ap				CLO2 , CLO4	PLO2 , PLo5, PLO7
3-4-5 (9, 16, 23 June 24)	Working principles and maintenance of conveying equipment	LLO1(3): Able to explain the working principles and maintenance of conveying equipment correctly according to academic principles.	U	1. Lecture on the topic: Working principles and maintenance of conveying equipment 2. Practice theoretical calculations of conveying equipment	1. Evaluate computational skills from providing agricultural problems of conveying equipment using Marking scheme. 2. End-of-chapter lecture/mid-term examination. 3. Students attend both lectures and laboratory on time.	Chiti, Thawatchai , Sunatha	CLO1 , CLO4	PLO2 , PLO5 , PLO7
	Midterm exams: Sat.10-Sun.18 Aug.2024							
6 (30 June 24)	The importance and nature of post-harvest products	LLO1(4): Able to explain the nature of products after harvest and post-harvest losses correctly according to academic principles.	U	1. Pre-test before learning After that, there is a lecture for students to have knowledge and understanding about the nature of products after harvest. 2. Watch a video clip and give homework to students to study more about related topics. 3. Divide students into groups according to the case study group. 4. Students practice the first practice in groups on the nature of agricultural products after harvest by finding learning equipment and observing changes in agricultural products.	1. Pre-test is done to evaluate students before studying. 2. Let students do homework and evaluate using Marking Schemes. 3. During the group laboratory, let students evaluate their friends in the group using Scoring Rubrics. and evaluate the performance during the lab 4. Let students write lab reports as a formative and summative student assessment using Marking Schemes 4. Observe classroom behavior 5. End-of-chapter lecture exam/mid-term exam 6. Students attend both lecture and lab sessions on time	Sunattha	CLO1 , CLO4	PLO2 , PLO5
		LLO2(5): Able to analyze and critically evaluate the factors affecting the nature of products after harvest and post-harvest losses in accordance with academic principles.	Ap				CLO2 , CLO4	PLO2 , PLO3 , PLO5 , PLO7

Week	Lesson	LLOs	L-Level	Teaching/Learning method	Assessment method	Instructor	CLOs	PLOs
				5. Write a single report (the results can be the same, but the summary and discussion must be different).				
7 (6 August 24)	Operation principles and maintenance of cleaning equipment	LLO1(6): Able to explain the principles of cleaning agricultural products after harvesting correctly according to academic principles.	U	1. Describe the working principles and maintenance of the cleaning equipment "Sorting Machine" 2. Watch the video clip 3. Students do the lab 2 in groups (with the 4th lab) 4. Make a report on the individual lab	1. Observe and evaluate student behavior in class 2. Evaluate student performance during group labs and have students evaluate their peers in the group using Scoring Rubrics 3. Evaluate students from lab reports using Marking scheme (on-time submission and quality of assigned work (if any)) 4. End-of-chapter lecture exam/mid-term exam 5. Students attend both lecture and lab sessions on time	Sunattha	CLO1, CLO4	PLO2, PLO5
		LLO2(7): Able to apply knowledge about the nature of agricultural products after harvesting to the use of cleaning equipment correctly according to academic principles.	Ap				CLO2, CLO4	PLO2, PLO3, PLO5, PLO7
8 (20 August 24)	Operation principles and maintenance of sorting equipment	LLO1(8): Able to explain the working principles and maintenance of sorting equipment used for agricultural products after harvesting correctly according to academic principles.	U	1. Describe the working principles and maintenance of the sorting equipment 2. Watch the video clip 3. Students do the group lab (do it together with the lab 2, cleaning and sorting can be done together) 4. Make a group lab report	1. Observe and evaluate student behavior in class and performance during the lab 2. Evaluate students during group labs and have students evaluate their peers in the group using Scoring Rubrics 3. Evaluate students from lab reports using Marking scheme (on-time submission and the quality of the assigned work (if any)) 4. Final lecture exam/midterm exam 5. Students attend both lecture and laboratory classes on time.	Sunattha	CLO1, CLO4	PLO2, PLO5
		LLO2(9): Able to apply knowledge about the nature of agricultural products after harvest to the use of sorting equipment correctly according to academic principles.	Ap				CLO2, CLO4	PLO2, PLO3, PLO5, PLO7
9 (27 August 24)	Thermodynamic and Heat transfer Basics and Psychometric & Application Using	LLO1(10): Able to explain the principles of Thermodynamics & Heat transfer and air conditioning related to the preservation of produce after harvest.	U	Lecture on the principles of Thermodynamics and Heat transfer and psychometrics.	1. Observe and evaluate student behavior in the classroom 2. Evaluate student performance during the laboratory using Scoring rubric (on-time submission and quality of assigned work (if any)) 3. End-of-chapter lecture/mid-term exams Evaluate exam results using Marking schemes	Sunattha	CLO1, CLO4	PLO2, PLO5
		LLO2(11): Able to apply their knowledge to air conditioning systems for	Ap	Application operation for air conditioning system analysis for post-harvest product storage			CLO2, CLO4	PLO2, PLO5

Week	Lesson	LLOs	L-Level	Teaching/Learning method	Assessment method	Instructor	CLOs	PLOs
		proper preservation of produce after harvest.			4. Students attend classes on time			, PLO7
10 (3 September 24)	Operation and maintenance principles of drying equipment	LLO1(12): Able to explain the working principles and maintenance of drying equipment for preserving agricultural products after harvest correctly according to academic principles.	U	1. Describe the working principles and maintenance of the drying equipment "Solar Dryer" 2. Watch the video clip 3. Divide students into groups to do the lab 3	1. Observe and evaluate student behavior in the classroom 2. Evaluate student performance during the laboratory using Scoring rubric (on-time submission and quality of assigned work (if any)) 3. End-of-chapter lecture/mid-term examination, evaluate examination results using Marking schemes 4. Students attend both lecture and laboratory classes on time	Sunattha, Naratip	CLO1 , **CLO 4**	PLO2 , PLO5
		LLO2(13): Able to apply knowledge about the nature of agricultural products after harvest to drying equipment correctly according to academic principles.	Ap				CLO2 , CLO4	PLO2 , PLO3 , PLO5 , PLO7
11 (10 September 24)	Cooling and preservation technology for post-harvest produce	LLO1(14): **Able to** explain the principles of cooling and preserving products after harvesting correctly according to academic principles.	U	1. Lecture on cooling and preservation technology after harvest 2. Watch video clip 3. Divide students into groups to do the lab together with lab 1	1. Observe and evaluate student behavior in the classroom 2. Students write lab reports as summative student assessment using Marking schemes 3. During group labs, students evaluate their peers using Scoring Rubrics 4. End-of-chapter lecture exams/midterm exams 5. Students attend both lecture and labs on time 6. Submit assignments on time and the quality of assigned work (if any)	Sunattha	CLO1 , CLO4	PLO2 , PLO5
		LLO2(15): **Able to** apply their knowledge to the use of cooling technology for the preservation of agricultural products after harvest.	Ap				CLO2 , CLO4	PLO2 , PLO5 , PLO7
12 (17 September 24)	Operation and maintenance principles of packaging equipment GAP GMP	LLO1(16): Able to explain the working principles and maintenance of packaging equipment.	U	1. Describe the operating principles and maintenance of packaging equipment.	1. Evaluate students' punctuality and classroom behavior and participation in the classroom 2. Final chapter/midterm exam 3. Evaluate on-time assignment submission and the quality of assigned work (if any)	Sunattha	CLO1 , CLO4	PLO2 , PLO5
13 (24 September 24)	Agricultural product logistic	LL01(17): Able to explain transportation and the context of transportation in relation to post-harvest produce.	U	1. Describe logistics 2. Problems base in class and exchange ideas between teacher and students 3. Ask questions	1. ประเมินนิสิตเข้าเรียนตรงต่อเวลา และพฤติกรรมในชั้นเรียน การมีส่วนร่วมในชั้นเรียน 2. สอบภาคบรรยายท้ายบท/สอบกลางภาค	Sunattha, Naratip	CLO1 , CLO4	PLO2 , PLO5

Week	Lesson	LLOs	L-Level	Teaching/Learning method	Assessment method	Instructor	CLOs	PLOs
					3. ประเมินจากการส่งงานตรงเวลา และคุณภาพผลงานที่มอบหมาย (ถ้ามี)			
14 (1 October 24)	GMP for Packing House	LLO1(18): **Able to** explain GMP principles for Packing House.	U	1. Describe the GMP principles for packing plants 2. Study the packing plants of the Food Safety Innovation Department 3. Make a report according to the given assignment ทำรายงานตามโจทย์ที่ได้รับ	1. Evaluate classroom behavior and 2. During the study visit to the packing plant 3. Evaluate individual reports submitted by students using Making schemes (on-time submission and quality of assigned work (if any)) 4. End-of-chapter lecture exams/mid-term exams 5. Students attend classes on time	Sunattha, Sasikan	CLO2, CLO4	PLO2, PLO5
15 (8 & 15 October 24)	Case study of post-harvest technology innovation for quality, safe and standardized products	LLO1(19): Able to apply the knowledge they have gained to research information to present technological innovations later.	Ap	1. Students study and research on their own the topic they have drawn. 2. Students work with the instructor to determine the scoring criteria and set the presentation date. 3. Inform the evaluation criteria from the report format and presentation.	1. Evaluate students from the report book with Rubrics score 2. Teachers and students jointly evaluate the presentation with Rubrics score 3. Students evaluate teamwork among group members 4. Students attend class on time	Sunatha, Chuti, Thawatchai	CLO3, CLO4	PLO4,PLO5,PLO6, PLO7
	Final exam: Mon. 21 Oct. – Nov. 1, 2024							

Remark: (1-19) Refers to the number of LLOs from 1 to 19