



Course Syllabus
First Semester, Academic Year 2024

1. Faculty of Agriculture at Kamphaeng Saen Department of Farm Mechanics

2. Course code: 02027321

Credit: 3(2-3-6)

Pre: 02027221

Course name: Principles of Farm Machinery I

3. Instructor team:

Assoc.Prof. Pongsak Chontanasawat

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Asst. Prof. Nonthawat Chainarong

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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:

5.1 Students learn and practice about agricultural tractors, drive systems, and be able to drive, operation, repair & maintenance for agricultural tractors, including attaching equipment to agricultural tractors.

5.2 Let students learn and practice about various power transmission systems and hydraulic systems of agricultural tractors.

5.3 Let students learn about the analysis of Statics of Tractor.

6. Course Description:

Principle of power source, power transmission, electrics, break and hydraulic system of farm tractor, practical operation and usage of farm tractor and pneumatics system in agriculture.

7. Program Learning Outcomes: PLOs

PLOs	Knowledge	Specific skills	Attitude
PLO3: Be able to select agricultural machinery correctly and appropriately with the objectives and goals of the desired results in a comprehensive manner	-Explain types, components, principles, repair & maintenance and operation of agricultural tractors -Explain tractor hydraulic systems -Use technical terms (English) related to agricultural tractors	-Have skills in working, using and maintaining agricultural tractors -Can attach tools to tractors -Have skills in seeking additional knowledge	- Awareness of safety in using tractors - Responsibility and discipline in working
PLO6: Be able to choose information technology (IT) to operate tasks appropriately		-Have skills in using IT in agriculture.	- Value and love to seek knowledge in IT

PLO7: Be able to use Thai and English language on duty for listening, speaking, reading and writing appropriately.		- Use relevant technical terms correctly in both Thai and English - Write various reports that are assigned	
PLO8: Display a willingness to be responsible, disciplined, diligent, patient, and honest, human relations in working with others, be a good leader and follower and have a relationship with the organization.		-Be a good leader and follower -Have problem-solving skills	-Be responsible and disciplined in your work - Be diligent and patient - Be punctual - Be honest

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

Course Learning Outcomes: CLOs	Methods for measuring learning outcomes	PLOs
CLO1: Explain the important components and working principles of all tractor systems, including the engine, transmission system, hydraulic system, and trailer hitch system.	1. Examination of the description of important components and working principles of all tractor systems. 2. Practical examination with a score of 60% or more. 3. Evaluate student performance skills and provide advice during every operation 4. Report performance results every time	PLO3 PLO6 PLO7
CLO2: Be able to do operational work and maintain tractors correctly according to academic principles.	5. Test tractor maintenance skills with a score of 60% or more. Test criteria show in Appendix	
CLO3: Be able to operate tractors and attached equipment.	6. Test skills in 1) driving a tractor, 2) attaching attachments to the tractor, and 3) controlling the forward-backward movement of the trailer. Test criteria show in Appendix 2 (Students must find free time to practice driving until they are able to do so, then they will be eligible to take the test.)	
CLO4: Be responsible, moral, ethical, disciplined, punctual, honest, responsible for oneself and society	7. Attend classes and be attentive to learning and practice and submit assigned work on time.	PLO8
CLO5: Have the skills to work with others as a good leader and member and can adapt to various situations appropriately.	Evaluate group work skills and provide advice on how to interact well in group work.	

9. 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 Section	1. Examination of all chapter lectures	40%
	2. Assignment	10%
	3. Submission of lecture notes/assigned documents	10%
9.2.2 Laboratory Section	1. Tractor driving skills practice test	5%
	2. Tractor attachment skills practice test	5%
	3. Tractor forward-reverse control skills practice test	5%
	4. Tractor maintenance skills practice test	5%
	5. Practice test	10%
The Assessment criteria for achievement measurement of all laboratory skill tests are shown in Appendix 1-3 (attached)		
9.2.3 Interest in learning, determination to perform, responsibility and teamwork.		10%
Total		100%

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

10. Documents to read:

Books, research reports, articles, and other relevant and up-to-date documents as assigned.

11. 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.

12. Review to improve teaching methods and teaching systems:

☐ No review because students were satisfied with the teaching in the previous session with a score of 4.31 and had 1 suggestion as “student want to increase TA”.

☒ Reviewed by reviewing from AMM courses verification of 2023 academic year as student want to increase TA, this was informed to the program committee. The program committee has a resolution by using the department income to hiring temporary staff.

☒ Not revised.....

☐ Revised to be consistent with.....

13. Teaching improvement from teaching evaluation results:

☐ No teaching evaluation

☒ Teaching evaluation,

☒ No improvement,

☐ Improvements as follows.....

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

Tuesday: Lecture 10:00-12:00 Laboratory 13:00-16:00 at Seminar room AMM Building, Mechanical workshop and Field lab.

15. The Assessment criteria for achievement measurement of all laboratory skill tests are shown in Appendix 1-3 (attached)

Signature _____
(Assoc.Prof. Pongsak Chontanasawat)
18 June 2024

Table 1 Schedule of activities related to teaching and learning of the 02027321 Principles of Farm Machinery I

No .	Lessons	LLOs	L-level	Teaching/Learning method	Assessment	Lecturer	CLOs	PLOs
1-2	- Explain Course Syllabus - Operational principles, power transmission system, utilization and maintenance of walking tractors - Practice walking tractor operation and utilization	- Able to explain the Operational principles of a walking tractor - Able to explain the important components of a walking tractor - Can use a walking tractor in agricultural work	K: Ap S:Man A:Rec	- Explain the learning outcomes (CLOs) , teaching methods, assessment, and measurement of learning outcomes through the Course Syllabus, and there are comments and agreements between teachers and students. - The Course Syllabus is uploaded on Ed-Farm for students to print out and bring to class every time. 1) Lecture section using media, slides, video clips and discussion, questions, and answers - Operational principles, power transmission system, utilization and maintenance of walking tractors 2) Laboratory section: Walking tractor operation Divides students into groups to perform 3 topics in rotation until all 3 topics are completed, with all students having to perform them themselves, including: 2.1) Operation and component of walking tractor. 2.2) Perform maintenance and repair of walking tractors* 2.3) Use walking tractors to work in the field* (*Practice skills outside of class time)	- Exam at the End-of-chapter lecture - Submit lecture note on Ed-Farm before next week's class - Assess students' practical skills during the practice - Submit the Ed-Farm practice results report before next week's class	Pongsak Thawatchai Vitawas Chuti	CLO1 CLO4 CLO5	PLO3 PLO6 PLO7 PLO8
3-4	- Operational principles, components and systems of tractors - Field visit: National Agricultural Machinery Center	- Able to explain the types, operational principles and important components of agricultural tractors, - Has skill in farm tractor	K: Ap S:Man A:Rec	1) Lecture section using media, slides, video clips and discussion, questions, and answers - Operational principles, power transmission system, utilization and maintenance of farm tractors 2) Laboratory section: - Visit the National Agricultural Machinery Center to study tractors that show important components and machinery related to tractors.		Thawatchai Vitawas Chuti	CLO1 CLO2 CLO4 CLO5	
5	- Operation and safety in tractor operation - Practice of safety in tractor operation	- Able to explain the safety of using tractors in work - Can drive tractors correctly	K: Ap S:Man A:Rec	1) Lecture section using media, slides, video clips and discussion, questions, and answers "Operation and safety of tractors" 2) Laboratory section Divides students into 5 groups to perform the operation, all students must do it by themselves. Demonstrate "Use and safety of tractors" and allow students to practice driving tractors	- Exam at the End-of-chapter lecture - Submit lecture note on Ed-Farm before next week's class - Assess students' practical skills during the practice - Submit the Ed-Farm practice results report before next week's class - Tractor driving skills practical test	Thawatchai Vitawas Chuti	CLO1 CLO2 CLO1 CLO2 CLO3 CLO4 CLO5	

No.	Lessons	LLOs	L-level	Teaching/Learning method	Assessment	Lecturer	CLOs	PLOs
				correctly in the specified format.” <i>(Students must practice additional skills outside of class time and when possible, make an appointment for individual examinations.)</i>	(5%) - Trailer forward-reverse control skills practical test (5%)			
6	- Tractor repair & Maintenance - Operation on Tractor repair & Maintenance	- Able to explain how to repair & Maintenance for tractors - Can repair & Maintenance for tractors	K: Ap S:Man A:Rec	1) Lecture section using media, slides, video clips and discussion, questions, and answers on topic: “Tractor repair & Maintenance” 2) Laboratory section Divides students into 5 groups to perform the operation, all students must do it by themselves. “Tractor repair & Maintenance” <i>(Students must practice additional skills outside of class time and when possible, make an appointment for individual examinations.)</i>	- Exam at the End-of-chapter lecture - Submit lecture note on Ed-Farm before next week's class - Assess students' practical skills during the practice - Submit the Ed-Farm practice results report before next week's class - Practical examination of tractor maintenance skills (5%)	Sombat Nonthawat Thawatchai	CLO1 CLO2 CLO3 CLO4 CLO5	
7-9	Describe and practice tractor power transmission system (Power Train), including clutch, gear, differential, final drive gear, brake and power take-off shaft.	- Able to explain the components and operation of the tractor powertrain system (Power Train), including clutch, gear, differential, final drive gear, brake, and power take-off shaft. - Have skill in farm tractor workshop.	K: Ap S:Man A:Rec	1) Lecture section using media, slides, video clips and discussion, questions, and answers on topic: “tractor power transmission system (Power Train), including clutch, gear, differential, final drive gear, brake and power take-off shaft.” 2) Laboratory section Divides students into 5 groups to perform the operation, all students must do it by themselves as: 2.1 Operation Components of clutch 2.2) Operation Components of “gear” 2.3) Operation Components of “differential” 2.4) Operation Components of “final drive gear and brake” 2.5) Operation Components of “power take-off shaft”	- Exam at the End-of-chapter lecture - Submit lecture note on Ed-Farm before next week's class - Assess students' practical skills during the practice - Submit the Ed-Farm practice results report before next week's class - Test the operation of tractors and important components and the operation of various parts and systems (5%)	Thawatchai Vitawas Chuti	CLO1 CLO2 CLO3 CLO4 CLO5	PLO3 PLO6 PLO7 PLO8
10-11	Principles and Operation of Hydraulic Systems of Agricultural Tractors (Draft and Position Control)	- Able to explain the operation of the hydraulic system of agricultural tractors (Draft and Position Control) - Have skill in hydraulics of farm tractor.	K: Ap S:Man A:Rec	1) Lecture section using media, slides, video clips and discussion, questions, and answers on topic: “the hydraulic system of agricultural tractors (Draft and Position Control)” 2) Laboratory section Divides students into 5 groups to perform the operation, all students must do it by themselves as: Control, adjust and maintain the hydraulic system of agricultural tractors, Draft Control and Position Control systems”	- Exam at the End-of-chapter lecture - Submit lecture note on Ed-Farm before next week's class - Assess students' practical skills during the practice - Submit the Ed-Farm practice results report before next week's class	Thawatchai Vitawas Chuti	CLO1 CLO4 CLO5	
12	-Electrical system in tractor	- Able to explain Electrical system	K: An S:Man A:Rec	1) Lecture section using media, slides, video clips		Sombat Nonthawat	CLO1 CLO4	

No .	Lessons	LLOs	L-level	Teaching/Learning method	Assessment	Lecturer	CLOs	PLOs
	-Operation Electrical system in tractor	in tractor. - Have skill in Electrical system in tractor		and discussion, questions, and answers on topic: “Electrical system in tractor” 2) Laboratory section Divides students into 5 groups to perform the operation, all students must do it by themselves as: Electrical system in tractor			CLO5	
13	- Tractor wheels and tires: Standards, types, sizes, tire pressure - Operation, maintenance of tractor wheels and tires	- Able to explain Tractor wheels and tires: Standards, types, sizes, tire pressure - Operation, maintenance of tractor wheels and tires. - Have skill in Tractor wheels and tires	K: An S:Man A:Rec	1) Lecture section using media, slides, video clips and discussion, questions, and answers on topic: “Tractor wheels and tires” 2) Laboratory section Divides students into 5 groups to perform the operation, all students must do it by themselves as: “Knowing the standards, types, sizes, tire pressures, and maintenance of agricultural tractor wheels and tires”		Thawatchai Vitawas Chuti	CLO1 CLO4 CLO5	
14	- Hitch System and Tool Attachment (Category) - Operation Hitch System and Tool Attachment	- Able to explain Hitch System and Tool Attachment (Category). - Have skill in Hitch System and Tool Attachment (Category).	K: An S:Man A:Rec	1) Lecture section using media, slides, video clips and discussion, questions, and answers on topic: “Hitch System and Tool Attachment (Category).” 2) Laboratory section Divides students into 5 groups to perform the operation, all students must do it by themselves as: “Hitch System and Tool Attachment (Category).” -Demonstrate attaching tools to tractors and reversing trailers after that student practice.” <i>(Students must practice additional skills outside of class time and when possible, make an appointment for individual examinations.)</i>	- Exam at the End-of-chapter lecture - Submit lecture note on Ed-Farm before next week's class - Assess students' practical skills during the practice - Submit the Ed-Farm practice results report before next week's class -Practical examination of skills in attaching peripheral equipment to tractors (5%)	Thawatchai Vitawas Chuti	CLO1 CLO2 CLO3 CLO4 CLO5	
15	- Statistic of tractor - Pneumatics principles in agriculture	- Able to explain Statistic of tractor - Able to explain Pneumatics principles in agriculture	K: An A:Rec	1) Lecture section using media, slides, video clips and discussion, questions, and answers on topic: “tractor statistics and its Calculation and principles of pneumatic systems in agriculture”	- Exam at the End-of-chapter lecture	Ratana	CLO1 CLO4	

Appendix 1: The criteria of Farm Tractor Maintenance Examination Assessment, Course 02027321

Maintenance Topics and Maintenance Checklist

Topic	Agricultural Tractor	Maintenance Checklist	Note
1	JD3028EN	1. Inspection of Lubricant Oil Level of Engine 2. Engine Oil Replacement and Oil Filter Change	The evaluator will ask four questions related to this topic.
2	JD3028EN	1. Inspection of Transmission-Hydraulic Oil Level 2. Transmission-Hydraulic Oil and Filter Replacement	The evaluator will ask four questions related to this topic.
3	TALOS130	1. Cleaning of Engine Air Filter 2. Replacement of Engine Air Filter Element	The evaluator will ask four questions related to this topic.
4	TALOS130	1. Lubrication of Front Axle 2. Inspection of Front Axle Oil Level 3. Replacement of Front Axle Oil 4. Inspection of Front Axle Alignment	The evaluator will ask four questions related to this topic.

Assessment Criteria for the Practical Examination on Farm Tractor Maintenance Covering All Exam Topics

Topic		Scoring Criteria			Score	Note
		1	3	5		
1	Effort	Kept looking down at the notes the entire time	Frequently read from the note sheet	Did not read from the note sheet	5	
2	Explanation	Explained all the information incorrectly	Explained some parts of the information incorrectly	Explained all the information correctly	5	
3	Indicating Maintenance Points	Indicated all maintenance locations incorrectly	Incorrectly identified some maintenance location	Correctly identified all maintenance locations	5	
4	Answering Questions	Answered fewer than 2 questions correctly	Answered 2 questions correctly	Answered all questions correctly	5	
Total					20	

Examination Requirements

1. Students must wear the official practical or field uniform properly and in accordance with university regulations in order to be eligible for the practical skill assessment.
2. Students who receive a score of 1 point in three or more assessment criteria will be considered as having failed the practical skill assessment. A retake will be required, and a minimum score of 60 percent must be achieved to pass the reassessment.

Appendix 2: Assessment Criteria for the Practical Examination on Farm Tractor Operation Assessment, Course 02027321

Topic	Agricultural Tractor	Assessment Items	Note
1	Kubota I3408	Three Point Hitch Linkage	Use main gear 2, sub gear L, at idle speed
2	New Holland TT3.50	Driving a Agricultural Tractor	Use main gear 2, sub gear L, at idle speed
3	Yanmar EF514T	Reversing a Agricultural Tractor with Trailer Attached	Use main gear 1 and sub gear 1 at engine idle speed, covering a distance of 20 meters

2.1 Assessment Criteria for the Practical Examination on Farm Tractor Operation: Three-Point Hitch Attachment

Topic		Scoring Criteria			Score	Note <u>Examination Prohibitions</u>
		5	3	1		
1	Reversing Toward the Implement	Drive using the left hand, start the tractor smoothly, and always turn your head to the right when reversing.	Drives with both hands, sometimes starts the tractor abruptly, or fails to turn their head to the right while reversing.	Drives with both hands throughout, starts the tractor aggressively, and does not turn their head to the right while reversing.	5	Reversed into the implement Used the wrong gear Failed to start the tractor Did not press the clutch pedal
2	Implement Attachment	Correctly attached and detached the implement in all steps	Incorrect attachment or detachment in some steps	Incorrect attachment or detachment in some steps	5	Unable to attach or detach the implement or performed all steps incorrectly. Unable to connect or disconnect the PTO shaft
3	Lifting and Placing the Implement	Lift the implement gently and place the implement gently.	Lifted the implement roughly or placed the implement with a loud noise.	Lifted the implement roughly or placed the implement with a loud noise.	5	
4	Driving the tractor away from the implement	Drive with the left hand, start the tractor smoothly, and check the area to the right before driving forward.	Drives with both hands throughout, starts the tractor aggressively, or fails to check the area to the right before driving forward.	Drives with both hands throughout, starts the tractor aggressively, or fails to check the area to the right before driving forward.	5	Towing the implement without disconnecting the PTO shaft
5	Duration	2-3.5 minutes	>3.5-4.5 minutes	>4.5-6 minutes	5	More than 6 minutes
Total					25	

Examination Requirements

1. Students entering the examination must wear the official practical or field uniform in accordance with regulations to be eligible for the practical skills assessment.
2. Students who receive a score of 1 point in two or more assessment criteria will be considered as having failed the practical skills assessment. A retake will be required, and a minimum score of 60 percent must be achieved to pass the reassessment."
3. Students who violate any of the prohibited actions during the examination will be required to retake the exam and will incur a deduction of 3 points from the total score on each retake.

2.2 Assessment Criteria for the Practical Examination on Farm Tractor Operation: Tractor Driving

Topic		Scoring Criteria			Score	Note <u>Examination Prohibitions</u>
		5	3	1		
1	Driving forward from the starting point uphill	Drive with the left hand, start the tractor smoothly, and avoid unnecessary clutch slipping.	Drive with both hands, or occasionally start the tractor abruptly, or unnecessarily slip the clutch.	Drive with both hands throughout, start the tractor aggressively, and continuously slip the clutch.	5	Collided with an obstacle, used the wrong gear, failed to start the tractor, did not press the clutch while starting the engine, and the tractor rolled downhill
2	Reversing from the incline into the parking space	Drive with the left hand, start the tractor smoothly, check behind to the right while reversing every time, and park the tractor accurately within the parking space.	Drive with both hands, occasionally start the tractor abruptly, fail to check behind to the right while reversing, or park the tractor inaccurately.	Drive with both hands throughout, start the tractor aggressively, fail to check behind to the right while reversing, and park the tractor inaccurately.	5	Performed all steps incorrectly, collided with an obstacle, and selected the wrong gear.
3	Driving forward and making a turning maneuver to reach the starting point.	Drive with the left hand, start the tractor smoothly, avoid unnecessary clutch slipping, and make a precise turn	Drive with both hands, occasionally start the tractor abruptly, slip the clutch more than necessary, or fail to make a proper turn	Drive with both hands throughout, start the tractor aggressively, slip the clutch continuously, and fail to make a complete turn	5	Performed the steps incorrectly, collided with an obstacle, and engaged the wrong gear.
4	Parking into the starting point slot	Stopped the tractor perfectly within the parking space and aligned it correctly with the stop line.	Stopped the tractor incorrectly within the parking space or parked beyond the stop line	Stopped the tractor incorrectly within the parking space or parked beyond the stop line	5	Collided with an obstacle
5	Duration	2-3.5 minutes	>3.5-4.5 minutes	>4.5-6 minutes	5	More than 6 minutes
				Total	25	

Examination Requirements

1. Students entering the examination must wear the official practical or field uniform in accordance with regulations to be eligible for the practical skills assessment.
2. Students who receive a score of 1 point in two or more assessment criteria will be considered as having failed the practical skills assessment. A retake will be required, and a minimum score of 60 percent must be achieved to pass the reassessment."
3. Students who violate any of the prohibited actions during the examination will be required to retake the exam and will incur a deduction of 3 points from the total score on each retake.

2.3 Assessment Criteria for the Practical Examination on Farm Tractor Operation: Reversing a Tractor with a Trailer Attached

Topic		Scoring Criteria			Score	Note <u>Examination Prohibitions</u>
		5	3	1		
1	Reversing the traile	Drive with the left hand, start the tractor smoothly, check behind to the right while reversing every time, and avoid unnecessary clutch slipping.	Drive with both hands, occasionally start the tractor abruptly, or slip the clutch more than necessary.	Drive with both hands throughout, start the tractor aggressively, and slip the clutch continuously.	5	Engaged the wrong gear, failed to start the tractor, did not press the clutch, collided with an obstacle, failed to check behind to the right while reversing, and the tractor and trailer formed an angle greater than 45 degrees.
2	Parking the trailer into the parking space	Stopped the tractor perfectly within the parking space and aligned it correctly with the stop line.	The tractor was not properly stopped within the designated parking space or was parked past the stop line.	The tractor was not properly stopped within the designated parking space or was parked past the stop line.	5	Collided with an obstacle and crossed the line.
3	Moving forward to the starting point	Drive with the left hand, start the tractor smoothly, and check behind to the right for safety before moving the tractor forward	Drive with both hands, occasionally start the tractor abruptly, or fail to check behind to the right for safety before moving the tractor forward.	Operate the tractor with both hands on the steering wheel at all times, initiate movement with excessive force, and neglect to perform a right-side safety check before proceeding forward.	5	Do not put your foot on the clutch pedal after the vehicle is moving.
4	Parking into the starting point slot	Stopped the tractor perfectly within the parking space and aligned it correctly with the stop line.	Stopped the tractor incorrectly within the parking space or parked beyond the stop line	Stopped the tractor incorrectly within the parking space or parked beyond the stop line	5	Collided with an obstacle
5	Duration	2-3.5 minutes	>3.5-4.5 minutes	>4.5-6 minutes	5	More than 6 minutes
				Total	25	

Examination Requirements

1. Students entering the examination must wear the official practical or field uniform in accordance with regulations to be eligible for the practical skills assessment.
2. Students who receive a score of 1 point in two or more assessment criteria will be considered as having failed the practical skills assessment. A retake will be required, and a minimum score of 60 percent must be achieved to pass the reassessment."
3. Students who violate any of the prohibited actions during the examination will be required to retake the exam and will incur a deduction of 3 points from the total score on each retake.

1. Operation of a Farm Tractor: Three-Point Hitch Attachment

[illegible]

2. Farm Tractor Operation: Driving

[illegible]

3. Farm Tractor Operation: Reversing a Tractor with Trailer Attachment

[illegible]