



University of Puerto Rico
Mayagüez Campus
College of Agricultural Sciences
Department of Agricultural and Biosystems Engineering
Agricultural and Environmental Systems



COURSE SYLLABUS

GENERAL INFORMATION:

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| COURSE TITLE: | Agricultural Tractors and Machinery |
| COURSE NUMBERING: | SAGA 4041 |
| CONTACT HOURS /CREDITS: | 90 hours / Four credits |
| PREREQUISITES, COREQUISITES AND OTHER REQUIREMENTS: | Prerequisite: FISI3091 or FISI3171 or FISI3151 |

COURSE DESCRIPTION:

- ENGLISH: Analysis of the principal components, operation and maintenance of tractors and agricultural machinery. Safety rules, power requirements, calibration and cost use of the tractors and the main agricultural machines will be evaluated. This course is offered in person.
- SPANISH: Análisis de los principales componentes, operación y mantenimiento de los tractores y la maquinaria agrícola. Se evaluarán las reglas de seguridad, los requisitos de potencia, la calibración y el costo de uso de los tractores y las principales máquinas agrícolas. Curso presencial.

LEARNING OBJECTIVES:

At the end of the course students will be able to:

- Identify and describe the main components and systems of tractors and agricultural machinery.
- Apply safety practices in the operation and maintenance of tractors and agricultural machinery.
- Evaluate power requirements and operational efficiency of tractors and farm implements.
- Calibrate agricultural machinery to ensure proper operation and performance.
- Estimate the operational costs of agricultural machinery for different applications.

SUGGESTED TEXTBOOK: Goering, C.E. and A.C. Hansen. (2008) *Engine and Tractor Power*, 4th Ed. ASAE Publication 801M0704. St. Joseph, MI. ISBN: 1892769425. Last edition.

Hunt, D. and D. Wilson. 2016. *Farm Power and Machinery Management*. 11th Ed. Waveland Press, Inc. Long Grove, Illinois. (ISBN 10: 1-4786-2696-8, 978-1-4786-2696-1). Last edition.

COURSE OUTLINE AND TIME DISTRIBUTION:

| TOPIC | TIME DISTRIBUTION (HOURS) |
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| I. Introduction to the Course | 1.5 |
| II. Farm Tractor Overview | 1.5 |
| III. Power Requirements of Implements and Tractor | 3 |
| IV. Field Capacity and Field Efficiency | 3 |
| V. Safe Operation of Agricultural Machines | 1.5 |
| VI. Soil Tillage Machinery | 1.5 |
| VII. Seeding and Transplanting Machinery | 3 |
| VIII. Mid-term Exam #1 | 1.5 |
| IX. Chemical Application Machinery | 4.5 |
| X. Grain Harvesting Machinery | 3 |
| XI. Forage Harvesting Machinery | 1.5 |
| XII. Machinery Costs and Equipment Selection | 3 |
| XIII. Introduction to Precision Agriculture Technologies | 1.5 |
| XIV. Mid-term Exam #2 | 1.5 |
| XV. Thermodynamics and Engine Components | 3 |
| XVI. Engine Power and Efficiencies | 1.5 |
| XVII. Weight Transfer and Traction | 1.5 |
| XVIII. Transmission, Differential, and Final Drive | 4.5 |
| XIX. Fuel and Lubricants | 1.5 |
| XX. Review for Final Exam | 1.5 |
| TOTAL HOURS | 45 hours |

| LABORATORY TOPIC | TIME DISTRIBUTION (HOURS) |
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| I. Introduction and Safety in the Laboratory | 3 |
| II. Unit Analysis | 3 |
| III. Power Transmission: Mechanical and Hydraulic | 3 |
| IV. Agricultural Tractor and Emissions | 3 |
| V. Work Capacity and Efficiency | 3 |
| VI. Farm Implements | 3 |
| VII. Selection of a Tractor to Match the Power Requirements of Tillage Equipment | 3 |
| VIII. Calibration of Agricultural Machinery / Attachment and Disengagement of Implements | 3 |
| IX. Precision Seeder Components and Calibration | 3 |

| LABORATORY TOPIC | TIME DISTRIBUTION (HOURS) |
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| X. Hydraulic Sprayer Components and Calibration | 3 |
| XI. Equipment Selection and Estimation of Cost of Use of Agricultural Machines | 3 |
| XII. Engine Components: Identification and Functions | 3 |
| XIII. Tractor PTO Power Measurement | 3 |
| XIV. Student Presentations on Current Topics in Agricultural Machinery | 6 |
| TOTAL HOURS | 45 hours |

INSTRUCTIONAL STRATEGIES:

Some of the following may be used:

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| <input checked="" type="checkbox"/> Lecture | <input type="checkbox"/> Project Based Learning |
| <input type="checkbox"/> Discussion | <input type="checkbox"/> Seminars or Workshops |
| <input type="checkbox"/> Cooperative Learning | <input checked="" type="checkbox"/> Problem Based Learning (PBL) |
| <input type="checkbox"/> Case Studies | <input type="checkbox"/> Flipped Classroom |
| <input type="checkbox"/> Lectures with Guest Speakers | |

MINIMUM OR REQUIRED RESOURCES AVAILABLE:

| RESOURCE | FACE-TO-FACE |
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| Classroom or laboratory | Institution |
| Account in the institutional learning management platform (e.g. Moodle or Blackboard) | Institution |
| Institutional email account | Institution |
| Computer with high-speed internet access or mobile device with data service | Student |
| Programs or applications: word processor, spreadsheets, presentation editor | Student |
| Webcam or mobile with camera and microphone | Student |
| Integrated or external speakers | Student |
| Whiteboard | Institution |
| Digital projector | Institution |

Other: Traditional classroom with audiovisual equipment for presentations. Agricultural tractor and implements for laboratory practices.

ASSESSMENT TECHNIQUES: (Examples of evaluation techniques)

| Assessment Technique | Relative Weight |
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| <input checked="" type="checkbox"/> Exams | 75% (25% each) |
| <input checked="" type="checkbox"/> Short quizzes | 5% |
| <input checked="" type="checkbox"/> Laboratory | 20% |
| Total: | 100% |

Standard scale: 90 to 100 A; 80 < 90 B; 70 < 80 C; 60 < 70 D; < 60 F

REASONABLE MODIFICATION (REASONABLE ACCOMMODATION):

The University of Puerto Rico (UPR) acknowledges the right of students with disabilities to an inclusive, equitable, and comparable post-secondary education. In accordance with its policy toward students with disabilities, based on federal and state legislation, every qualified student with disabilities is entitled to equal participation in those services, programs, and activities that are physically, mentally or sensorially natured and have thus substantially affected one or more major life activities, such as their area of post-secondary studies. They have the right to receive reasonable accommodation or modifications. If you require accommodation or reasonable modification in the course, you must inform the professor without the need to disclose your condition or diagnosis. Simultaneously, you should promptly request the Office of Services for Students with Disabilities (OSEI) of the unit or campus for your need for modification or reasonable accommodation.

The University of Puerto Rico at Mayagüez (RUM) recognizes that each student has an inherited right to request reasonable accommodation according to Law 51: Law for Integral Educational Services for People with Disabilities. Every student has the right to receive reasonable accommodation if he/she presents the necessary evidence to be evaluated by the Office of Services to Students with Disabilities (OSEI-RUM), and the related information can be found at the following link: <https://www.uprm.edu/cms/index.php/page/85>. If your case is approved by OSEI-RUM, you will receive reasonable accommodation in your courses and evaluation, and you must contact each professor for course registered. For additional information contact OSEI-RUM at the Office of the Dean of Students, DE 12, via telephone 787-832-4040 extensions 6734 or 6735, email: oseirum@uprm.edu, at the virtual office: <https://meet.google.com/yvd-nrqo-mor>, or join by telephone: (US)+1 475-558-0169 PIN: 814 895 818#.

ACADEMIC HONESTY:

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Section 6.2 of the UPR General Student Regulations (Certification No.13, 2009-2010, Board of Trustees) provides that academic dishonesty includes, but is not limited to: “fraudulent actions, obtaining grades or academic degrees by false or fraudulent simulations, copying all or part of another’s academic work, copying all or part of another’s answer to questions on an examination, taking or having another take any oral or written test or

examination on behalf of another, and aiding or facilitating another person to engaging such conduct.” Any of these actions will be subject to disciplinary sanctions in accordance with the disciplinary procedure provided in the UPR General Student Regulations in force. To ensure the integrity and security of user data, all hybrid, distance-learning and online courses shall be offered through the institutional learning management platform or through tools required by the course, which uses secure connection and authentication protocols. The system authenticates the user identity using the username and password assigned through the student institutional account. The user is responsible for keeping secure, protecting, and not sharing their password with others.

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| POLICY AND PROCEDURES TO MANAGE SEX AND GENDER-BASED DISCRIMINATION AT THE UNIVERSITY OF PUERTO RICO: |
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The Policy and procedures to Manage Sex and Gender-Based Discrimination at the University of Puerto Rico, Certification No. 107 (2021-2022) of the Governing Board, certifies that the University of Puerto Rico, as an institution of higher learning and a workplace, safeguards the rights and offers a safe space for those who interact therein, whether they be students, employees, contractors, or visitors. It seeks to promote an environment that respects diversity and the rights of the university community. This policy provides a protocol for handling situations related to the following prohibited conduct in the workplace or in the academic setting: discrimination based on sex, gender, pregnancy, sexual harassment, sexual violence, domestic violence, dating, violence, and stalking.

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| CONTINGENCY PLAN IN CASE OF AN EMERGENCY OR INTERRUPTION OF CLASSES |
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In the event of an emergency or interruption of classes, the professor will contact the students through the institutional email or other available means to coordinate the continuity of the course.

The contingency plan must preserve the modality in which the course was created and programmed in the course offering.

Certification 23-29 of the Academic Senate establishes that a face-to-face course may have up to 25% of the hours at a distance and if necessary, this option may be used.

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| DIVERSITY, EQUITY, AND INCLUSION |
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The University of Puerto Rico is committed to establishing an environment that values diversity, promotes equity and equality, and aspires to the full inclusion of its entire university community. Courses will be offered in an inclusive and equitable environment, ensuring the participation of students with diverse backgrounds, experiences, and abilities. Thus, the University of Puerto Rico reiterates its dedication to upholding the principles of diversity, equity, and inclusion in its academic programs.

GRADING SYSTEM

☒ Quantifiable (letters, A, B, C, D, F) ☐ Not Quantifiable (Pass, Fail)

BIBLIOGRAPHY:

- Bell, B. 2015. Farm Machinery, 6th Ed. Rev. 5M Publishing Limited, U.K. (ISBN: 1910456233, 9781910456231). Latest Edition.
- Goering, C.E. and A.C. Hansen. (2008) Engine and Tractor Power, 4th Ed. ASAE Publication 801M0704. St. Joseph, MI. ISBN: 1892769425. Latest Edition.
- Holden, N. M., Mary Leigh Wolfe, Jactone A. Ogejo, Enda J. Cummins. 2021. Introduction to Biosystems Engineering. American Society of Agricultural and Biological Engineers (ASABE) and Virginia Tech Publishing. (ISBN (PDF) 9781949373974, ISBN (print) 9781949373936). <https://doi.org/10.21061/IntroBiosystemsEngineering>
- Hunt, D. and D. Wilson. 2016. Farm Power and Machinery Management. 11th Ed. Waveland Press, Inc. Long Grove, Illinois. (ISBN 10: 1-4786-2696-8, 978-1-4786-2696-1). Latest Edition.
- Ortíz Cañavate, J. 2012. Las máquinas agrícolas y su aplicación. 7ma Ed. Ediciones Mundi-Prensa. Madrid, España. (ISBN 10: 8484764311, 9788484764311). Latest Edition.
- Ortíz Cañavate, J. 2012. Tractores: Técnica y Seguridad. Ediciones Mundi-Prensa. Madrid, España. (ISBN: 8484765202, 9788484765202). Latest Edition.

Electronic references:

- ASABE Standards, 2024. American Society of Agricultural and Biological Engineers. Available at: <https://elibrary.asabe.org/standards.asp>.
- Holden, N. M., Mary Leigh Wolfe, Jactone A. Ogejo, Enda J. Cummins. 2021. Introduction to Biosystems Engineering. American Society of Agricultural and Biological Engineers (ASABE) and Virginia Tech Publishing. (ISBN (PDF) 9781949373974, ISBN (print) 9781949373936). <https://doi.org/10.21061/IntroBiosystemsEngineering>
- Nebraska Tractor Test Laboratory. Test Reports. 2024. Available at: <https://tractortestlab.unl.edu/test-page-nttl>