**The University of Jordan**

**Faculty: Faculty of Agriculture**

**Department: Department of Horticulture and Crop Science**

**2013-2014/First semester**

**Course Title: Principles of Agricultural Mechanization (601250)**

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| **Credit hours** | 3 | **Level** | Second year | **Pre-requisite** | Physics |
| **Coordinator/ Lecturer** | Dr. Issa A. Gammoh | **Office number** | 218 | **Office phone** | 22337 |
| **Course website** |  | **E-mail** | i.gammoh@ju.edu.jo | **Place** | Aud. 132 |

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| **Office hours** | | | | | |
| **Day/Time** | **Sunday** | **Monday** | **Tuesday** | **Wednesday** | **Thursday** |
|  | **-----** | **12:30 – 13:30** | **-----** | **12:30 – 13:30** | **-----** |
|  | **10:00 – 11:00** | **-----** | **-----** | **-----** | **10:00 – 11:00** |

**Course Description**

This course covers fundamentals of applied mechanics and power transmission systems used in agricultural machines. The course also covers types, principles of operation and selection of the most common machinery used in agricultural field operations. This covers agricultural tractors, tillage and soil preparation equipment, planting and fertilizing machines, crop protection equipment and harvesting machines.

**Learning Objectives**

1. To provide simplified understanding of theory and principles of basic applied mechanics and power transmission methods used in machines as users and managers
2. To provide information on the latest machinery in use in the agriculture industry.
3. To provide information in an unbiased manner so fair comparisons and selection could be made based upon need.

**Intended Learning Outcomes (ILOs):**

Successful completion of the course should lead to the following outcomes:

**A. Knowledge and Understanding:** Student is expected to

**A1-** get information on the history of agricultural mechanization its importance, objectives and trends of development locally and worldwide.

**A2-**acquire knowledge of how complicated machines consist of a combination of simple ones.

**A3-** acquire knowledge and good understanding of different power transmission methods used on modern machines and the advantages and disadvantages of each method.

**A4-** acquire, as a user, knowledge of types and classifications of agricultural tractors, their configurations and system of operations of tractor components

**A5**- acquire, as a user, knowledge of types and classifications of different modern agricultural machines and equipment used in agricultural operations nowadays.

**B. Intellectual Analytical and Cognitive Skills:** Student is expected to

**B1-** judge different machines by their mechanical advantage, efficiency and capacity,

**B2-** analyze and compare different methods of power transmission used on modern machines,

**B3-** determine the factors affecting capacity and efficiency of a working agricultural machine.

**B4-** distinguish between different types of ICE and Tractors and tell about different features of them

**C. Subject- Specific Skills:** Students is expected to

**C1-** select the proper size and type of tractors for a given farm of given size and conditions,

**C2-** select proper machines and equipment for each agricultural operation,

**C3-** determine the proper procedure ofadjustment and calibration and calculate the application rate for a specific type of grain rill and field crop sprayer

**D. Transferable Key Skills:** Students is expected to

D1- demonstrate good communication skills with farmers to provide information on the latest machinery in use in the agriculture industry,

D2- supervise operators involved in the mechanization of agricultural operation.

# ILOs: Learning and Evaluation Methods

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| **ILO/s** | **Learning Methods** | **Evaluation Methods** |
| **A**. Knowledge and Understanding (**A1-A5**) | Lectures and Discussions, Homeworks and Assignments, (Reports, & presentations | Exam, Quiz, |
| **B**. Intellectual Analytical and Cognitive Skills (**B1-B4**) | Lectures and Discussions, Homeworks | Exam, Quiz, and homework's evaluation |
| **C**. Subject Specific Skills (**C1-C3**) | Lectures and Discussions, workshop lab and yard visits, Demos | Report and assignments' evaluation |
| **D**.Transferable Key Skills (**D1-D2**) | Presentation (optional), reports | Presentations and reports evaluation |

**Course Contents**

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| --- | --- | --- | --- |
| **Content** | **Reference No \*** | **Week** | **ILO/s** |
| **Introduction**: Definitions, history, objectives, problems and development of agricultural mechanization | **1,12** | **W1** | **A1** |
| **Mechanics:** Basic mechanical principles and definitions, static forces and equilibrium, basic machine elements | **1, 2, 3,12** | **W1 – W3** | **A2** |
| 1. **Homework # 1:** 2. Solving different basic mechanics and equilibrium problems, and calculating machine static and dynamic forces, Efficiencies | **1, 2, 3,12** | 1. **Due date: end of 2nd week** | **A2, B1** |
| 1. **Un announced Quiz #1** | **1, 2, 3,12** | **Within 3rd week** | **A1, A2, B1, B3** |
| 1. **Power for agricultural machines and the principles of its transmission**:   -Mechanical power transmission: V-belts and pulleys, chains and sprockets, gears, PTO drives and flexible shafting    **-**Fluid power and hydraulic systems: Basic principles of fluid power. Hydraulic system components. Types of fluid power systems. | **1, 2, 3, 8** | **W4**  **W5** | **A3, B1, B2, B3** |
| 1. **Un announced Quiz # 2** | **1, 2, 3,8,12** | **Within 4th week** | **A3, B1, B2, B3** |
| 1. **Announced Quiz #3** | **1, 2, 3,8** | **End of 5th week** | **A2, B1, B2, B3** |
| 1. **Agricultural tractor:** Types and Classifications, Components and their systems of operation. 2. IC engine construction, system of operation and types. 3. Power train construction , types, components and their system of operation. Power outputs. Tractor hitching and traction**.** | **4,7,8,9,12** | 1. **W6**   **W7**  **W8** | **A4, B3, B4, C1, D1** |
| 1. **Machinery Workshop lab visit #1:** 2. Tractor and engine lab modelsdemos | **4,7,8,9,12** | **End of 8th week** | **A4, B3, B4, C1, D1** |
| 1. **Announced Quiz #4** | **4,7,8,9,12** | **End of 8th week** | **A4, B3, B4, C1, D1** |
| **Soil tillage and soil preparation equipment**: Introduction, tillage definition and objectives. Tillage methods and practices.  Primary tillage implements, their types and specific features.  Secondary tillage implements, their types and specific features. | **5,12** | **W9**  **W10**  **W11** | **A5, B3, C2, D1, D2** |
| 1. **Machinery Workshop yard visit #2:** 2. Primary and Secondary tillage equipment demos | **5, 12** | **End of 11th week** | **A5, B3, C2, D1, D2** |
| 1. **Unannounced Quiz #5** | **5, 12** | **within 11th week** | **A5, B3, C2, D1, D2** |
| **Tillage groups' Reports** | **5, 12** | **Due date: 11th week** | **A4, B3, C2, D1, D2** |
| **Planting equipment**: Introduction, Planter requirements. Methods and equipment (Broadcasting, Drilling, Precision planting, Transplanting), broadcasters.  Grain drill (components, rate of application and calibration)  Transplanter configuration, principle of operation and calibration | **6,12** | **W12**  **W12-13**  **W13** | **A5, B1, B3, C2, C3** |
| **Fertilizing and crop protection equipment:**  Fertilizer and dry chemicals spreading equipment  Application of liquid chemicals; methods, equipment and types. Hydraulic sprayers; components and parts, Rate of application and calibration | **6,12** | **W14** | **A5, B1, B3, C2, C3** |
| **Harvesting equipment:**  Principles of operations and types of forage making and harvesting equipment, grain harvesting equipment, root harvesting equipment. | **10, 11, 12** | **W15** | **A5, B1, B3, C2** |
| 1. **Machinery Workshop yard visit #3:** 2. Planting , Crop protection and harvesting equipment Demos | **10, 11, 12** | **End of 15th week** | **A5, B1, B3, C2, C3** |
| **Groups' Presentations** |  | **Due: by end of 16th week** | **A3-A5, B3, C1-C3, D1-D3** |

**Learning Methodology**

## The course duration is 16 weeks = 48 hours including holidays that might occur during the semester. These hours are distributed as following:

## 36 hours are lectures. Quizzes will be held during lectures time. Each lasts between 5 and 10 minutes.

## 3 hours - midterm exam + exam discussions.

## 1.5 hours - homework's' discussions.

## 4.5 hours - workshop visits and demos.

## 3 hours – groups' presentations.

# Evaluation

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| --- | --- | --- |
| **Evaluation** | **Point %** | **Date** |
| Midterm Exam | **30** | End of 8th week |
| Homework, Assignments  Quizzes, and presentation | **20** | See course content table above |
| Final Exam | **50** | Assigned by Registrar |

# USEFUL REFERENCES:

There is no specific text book for this course. The following could be useful to refer to while covering different topics of the course:

1. Farm Machinery. Claude Culpin. 10th edition.
2. Farm Machinery and Equipment. Smith and Wilkes. 6th edition.
3. Farm Power and Machinery Management. Hunt.
4. FMO, Tractors. John Deere Publications.
5. FMO, Tillage. John Deere Publications.
6. FMO, Planting. John Deere Publications.
7. FOS, Power Train. John Deere Publications.
8. FOS, Hydraulics. John Deere Publications.
9. FOS, Maintenance. John Deere Publications.
10. FMO, Hay and Forage Harvesting. John Deere Publications.
11. FMO, Combine Harvesting. John Deere Publications.
12. Farm Machinery, A.G. Harris, T.B. Muckle, and J.A. Show.

**Notes:**

* ***Note 1*** : Examination, Grades Evaluation and Attendance policy are administered according to UOJ instructions, terms and regulations. For more details on University regulations please visit:

<http://www.ju.edu.jo/rules/index.htm>

* ***Note 2*** : Course assignments (reports and presentations) are to be completed as instructed. These are interfaced with topics to be covered and the same questions may be used in quizzes or exams. The assignment grade will be reduced by 1/10 of the maximum grade for each day that it is late. Students are divided into groups, where each group will prepare and present its work as an oral and written report. Enough copies of that report should be made and distributed to other groups.
* ***Note 3*** : Concerns or complaints should be expressed to the module lecturer

**Grading Scale**

* **First option**

Statistical normal distribution of all students' total points will be used for final grading. The Average (AVRG) and standard deviation (STDev) are defined, where the AVRG is graded either "C" or "C+" grade, then the AVRG + 2 or 1.5 STDev is graded as "A". The grade "F" total points are defined (usually between 45 and 50). The grades are then distributed over intervals between "A" and "F". The length of each interval is proportional to the scale weight of each grade

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| --- | --- |
| **Scale weight** | **Grade** |
| 0 | F |
| 0.75 | D- |
| 1 | D |
| 1.5 | D+ |
| 1.75 | C- |
| 2-2.49 | C |
| 2.5 | C+ |
| 2.5-2.99 | B- |
| 3 | B |
| 3.5 | B+ |
| 3.75 | A¯ |
| 4 | A |

* **Second** **option**

|  |  |  |  |
| --- | --- | --- | --- |
| **From (%)** | **To (%)** | **Mark** | **Scale** |
| 0 | 44 | F | 0 |
| 45 | 47 | D- | 0.75 |
| 48 | 54 | D | 1 |
| 55 | 60 | D+ | 1.5 |
| 61 | 63 | C- | 1.75 |
| 64 | 66 | C | 2 |
| 67 | 72 | C+ | 2.5 |
| 73 | 75 | B- | 2.5 |
| 76 | 78 | B | 3 |
| 79 | 84 | B+ | 3.5 |
| 85 | 87 | A¯ | 3.75 |
| 88 | 100 | A | 4 |