COURSE CONTENT

Course ABE 322 - AGRICULTURAL POWER & MACHINERY II (3 UNITS)
Course status - Compulsory

Course Duration
Three hours- (2 hours lecture and 1 hour for practical) per week for 15 weeks (45 hours)

Lecturer Data
Engr. T.A. Adekanye
Department of Agricultural and Biosystems Engineering
College of Science and Engineering
E-mail: adekanye.timothy@lmu.edu.ng
Office Location: Room 107, CSE Building.
Consultation Hours: Tuesdays: 1- 3 pm, Thursdays: 11 am – 1 pm.

Course Content:
Review of farm power sources. Transmission of power in farm machinery. Tractor power outlets. Tractor mechanics and power measurements. Tractor test and test codes. Ergonomics considerations. Hitches and hitch systems. Operations and maintenance of farm machinery. Field evaluation and cost analysis of use of agricultural machines. Criteria for replacement.

Course Description:
Agricultural Engineering is a unique discipline because it involves the application of almost all aspects of other engineering disciplines including Animal Science, Soil Science, Agricultural Economics, etc. One of the most important problems in developing countries is the level of awareness and importance given to agricultural development. The role of agricultural education is vital as it is directly linked to the effectiveness of the economy in providing the requirement of trained manpower for the development process. In modern agricultural production, power is very important for an appropriate level of mechanization to be achieved. It is therefore inevitable that any practicing agriculturist should know the relevant power sources available for agricultural work.

Course Justification:
The topics covered in this subject will enable the students to understand the basic principles, construction and working of farm machinery for different crops. This will also enable them to select appropriate machinery, use, and repair and maintain the same. This knowledge will be highly useful in running an Agro Service Centre for Farm Machinery.

Course objectives

1. To provide a sound knowledge in the study of agricultural power and machinery in order to facilitates students interest in agricultural engineering;
2. To provide suitable materials with adequate illustrations based on local problems and issues that affect tropical agriculture.
3. Discuss various power sources available for agricultural work
4. Be able to select, use, repair and maintain appropriate agricultural machinery
5. This knowledge will be highly useful in running an Agro Service Centre for farm machinery.

Course Requirements:

1. Students must have passed ABE 311; a prerequisite for ABE 322
2. Students must have a minimum 70% attendance and participate in all practical classes.
3. No student shall be allowed in for this lecture 20 minutes after the allocated time or entrance of the course teacher.
4. Assignment that was not submitted and delivered to the course teacher within the stipulated time frame shall not be graded.
5. Students shall be required to read beyond what is provided in class or compliment class jottings by making reference to text books for better grade standing.

Method of Grading-

S/N	**Grading**	**Score** (%)
1.	Test	10
2.	Assignment	10
3.	Practical	10
4.	Final Examination	70
	Total	**100**

Course Delivery Strategies:

Lecturing method complimented with field practical work will be adopted. There shall be Power point presentations especially in illustrative topics coupled with note dictations.

LIST OF PRACTICALS

To study the constructional features and different components of the following agricultural implements/ farm machines:

1. Primary tillage implements: Mould board plough /Disc plough.

2. Secondary tillage implements: Harrow/Cultivators, Rotavator

3. Planting Machines: Seed Drill/Planter

4. Harvesting Machines: Vertical Conveyer Reaper/Mower/Potato digger/Groundnut Digger.

5. Threshing Machines: maize thresher, axial flow thresher, High capacity multi-crop thresher

6. Other relevant practical in agricultural and machinery

Note: Emphasis would be laid on operation, maintenance, repair, safety and trouble shooting of farm machines and calibration of seeding machinery.

LECTURE CONTENT

Week 1: Review of farm power sources

Objectives

The students at the end of the lectures for the week should be able to;

1. Understand the concept and sources of power for agricultural work,
2. Describe internal combustion engines,

Study Question:

1. Outline sources of power for agriculture

Reading List:

1. Principles of Farm Machinery by Kepner R. A., Bainer R., and Barger E. L. 1997. 2nd Ed. AVI Publishers Connecticut. USA.
2. Elements of Agricultural Engineering by Jagdishwar, S.2010.. Standard Publishers Distributors, Delhi
3. Farm Power Machinery Volume-I by ISAE ; Jain brothers

Week 2: Transmission of power in farm machinery.

Objectives

The students at the end of the lectures for the week should be able to;

3. Identify the terms which are used to describe power and be able to explain them
4. Describe the mechanical advantage effect of a lever and its influence upon torque

5. Identify the relation which exist between developing torque and power

Study Questions:

2. Identify the four major components of a power train and list the function of each
3. List the five types of clutches used in agricultural equipment and identify one feature of each.

Reading List:

4. Principles of Farm Machinery by Kepner R. A., Bainer R., and Barger E. L. 1997. 2nd Ed. AVI Publishers Connecticut. USA.
5. Elements of Agricultural Engineering by Jagdishwar, S.2010.. Standard Publishers Distributors, Delhi
6. Farm Power Machinery Volume-I by ISAE ; Jain brothers

Week 3: Transmission of power in farm machinery continue Cont'd

Objectives - The students at the end of the lectures for the week should be able to;

1. Describe the methods by which an engine develops torque and power
2. Identify three terms used in agricultural power and machinery that describe power
3. Describe the two ways by which agricultural tractors are rated for power and how each can be measured

Study Questions:

1. What is the purpose of each of the following parts of a final drive assembly?

a. Bevel pinion and bevel gear
b. Differential assembly
c. Individual wheel or differential brakes
d. Bull gears

Reading List:

1. Machines for Power Farming by Stone A. A. and Culvin H. E. 3rd Ed. John Wiley. New York.
2. Engineering Principles of Agricultural Machines by Ajit, K. Srivastava, Carrol, E. Goering, Roger, P. Rohrbach and Dennis, R. Buckmaster. ASABE.
3. Elements of Agricultural Engineering by Jagdishwar, S.2010.. Standard Publishers Distributors, Delhi.
4. Fundamentals of Engineering for Agriculture by A.P. Onwualu, C.O. Akubuo and I.E. Ahaneku. 2006. Immaculate publications Limited, Enugu - Nigeria

Week 4: Tractor power outlets.

Objectives - The students at the end of the lectures for the week should be able to;

1. Identify the types and purposes of Tractor power outlets
2. Describe the PTO in detail

Study Questions:

1. Sketch and label a PTO
2. Give some specifications of Power take off of modern tractors

Reading List:

1. Principles of Farm Machinery by Kepner R. A., Bainer R., and Barger E. L. 1997. 2nd Ed. AVI Publishers Connecticut. USA.
2. Tractors and Their Power Units by Liljedahl J. B., Carlton W. M., Turnquist P. K., and Smith D.W. 1997. 3rd Ed. John Wiley. New York
3. Agricultural Engineers Yearbook by Richey L. B., Jacobson R., Hall C. W. Mc.Graw Hill Co. USA
4. Machines for Power Farming by Stone A. A. and Culvin H. E. 3rd Ed. John Wiley. New York.
5. Engineering Principles of Agricultural Machines by Ajit, K. Srivastava, Carrol, E. Goering, Roger, P. Rohrbach and Dennis, R. Buckmaster. ASABE.
6. Elements of Agricultural Engineering by Jagdishwar, S.2010.. Standard Publishers Distributors, Delhi.

Week 5: Tractor mechanics and Power measurement

Objectives - The students at the end of the lectures for the week should be able to;

1. Know causes of breakdown of tractors
2. Maintain a tractor for effective use
3. Repair minor faults

Reading List:

1. Farm Power Machinery Volume-I by ISAE ; Jain brothers
2. Elements Of Agricultural Engineering Part 1 & 2 by Dr. O.P. Singhal and Naresh Chandra Aggarwal ; Mumfordganj, Allahabad
3. Tillage System in the Tropics by FAO; Oxford and IBH Publication Co.

Week 6: Tractor mechanics and Power measurement Cont'd

Week 7: Tractor test and test codes

Objectives - The students at the end of the lectures for the week should be able to;

1. Describe different types of tractor test and codes
2. Know design considerations for tractors

Study Questions:

1. What are the important test conditions of tractor?
2. How is belt performance test different from drawbar performance test?

Reading List:

1. Elements Of Agricultural Engineering Part 1 & 2 by Dr. O.P. Singhal and Naresh Chandra Aggarwal ; Mumfordganj, Allahabad
2. Tillage System in the Tropics by FAO; Oxford and IBH Publication Co.
3. Farm Power Machinery Volume-I by ISAE ; Jain brothers
4. Element of Farm Machinery by A. C.Srivastava and Raju Primlari; Oxford &IBH Publishing Co. Pvt Ltd, New Delhi

Week 8: Tractor test and test codes Cont'd

Week 9: Mid – semester examination

Week 10: Hitches and hitch systems

Objectives - The students at the end of the lectures for the week should be able to;

1. Determine weight on the wheels of a tractor
2. Determine tractive force and rolling resistance of a tractor

Study Questions:

1. Take measurement of the three – point linkage system on a tractor and associated soil engaging implementing.

Reading List:

1. Elements Of Agricultural Engineering Part 1 & 2 by Dr. O.P. Singhal and Naresh Chandra Aggarwal ; Mumfordganj, Allahabad
2. Tillage System in the Tropics by FAO; Oxford and IBH Publication Co.
3. Farm Power Machinery Volume-I by ISAE ; Jain brothers
4. Element of Farm Machinery by A. C.Srivastava and Raju Primlari; Oxford &IBH Publishing Co. Pvt Ltd, New Delhi

Week 11: Hitches and hitch systems (Continue)

Week 12: Ergonomics consideration

Objectives - The students at the end of the lectures for the week should be able to;

1. Understand the meaning of ergonomics with respect to tractor design

Study Questions:

1. What is ergonomics?

Reading List:

1. Engineering Principles of Agricultural Machines by Ajit, K. Srivastava, Carrol, E. Goering, Roger, P. Rohrbach and Dennis, R. Buckmaster. ASABE.
2. Elements of Agricultural Engineering by Jagdishwar, S.2010.. Standard Publishers Distributors, Delhi.
3. Fundamentals of Engineering for Agriculture by A.P. Onwualu, C.O. Akubuo and I.E. Ahaneku. 2006. Immaculate publications Limited, Enugu - Nigeria

Week 13: Operations and maintenance of farm machinery

Objectives - The students at the end of the lectures for the week should be able to;

1. Understand causes of agricultural machinery breakdown
2. Select appropriate agricultural machinery
3. Maintain agricultural machinery
4. Do cost analysis of agricultural machinery and Replace agricultural machinery

Study Questions:

1. What are the causes of agricultural machinery breakdown?
2. Mention types of maintenance of agricultural machinery

Reading List:

1. Engineering Principles of Agricultural Machines by Ajit, K. Srivastava, Carrol, E. Goering, Roger, P. Rohrbach and Dennis, R. Buckmaster. ASABE.
2. Elements of Agricultural Engineering by Jagdishwar, S.2010.. Standard Publishers Distributors, Delhi.
3. Fundamentals of Engineering for Agriculture by A.P. Onwualu, C.O. Akubuo and I.E. Ahaneku. 2006. Immaculate publications Limited, Enugu - Nigeria

Week 14: Revision

Week 15: Examination

Objectives: To examine the students on all that has been taught during the semester.