

COURSE CODE: AGE 102
COURSE TITLE: Introduction to Agricultural Engineering
CREDIT UNITS: Units
DURATION: 1 HOURS/WEEK

COURSE DETAILS:

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COURSE CONTENT:

Definition of Agricultural Engineering, various branches (options), ***contributions of Agricultural Engineering to National development**, Farm power (sources of power) – human, animal, mechanical, electrical, wind and hydro power; introduction to farm machinery – machine elements, machines for tillage, crop cultivation, seeding, weeding, plant protection, fertilization, harvesting, postharvest technology; Farm buildings such as farmstead and farm residence, animal shelters, storage structures, building materials; Post harvest technology – principles of crop drying, milling, processing, preservation, packaging; Principles of soil conservation, introduction to irrigation, drainage and farm electrification; scope of agricultural mechanization, Job prospects for agricultural engineers.

COURSE REQUIREMENT:

This is a compulsory course for all 100 level Agricultural Engineering Students. Students are required to participate in all class activities and have a minimum of 75 % attendance to qualify for final examination.

READING LIST:

LECTURE NOTES:

1.0 Introduction

Agricultural Engineering is a specialized branch of engineering which deals with the application of engineering science and technology to agricultural production with the aim of reducing complexity and increasing productivity. Agricultural production is faced with a number of challenges and problems such as production of crops and animals; storage; processing; management of resources required for production such as land, water, energy, waste disposal and utilization etc. Agricultural engineering evolved out of the three founding branches of engineering namely: Civil, Mechanical and Electrical Engineering.

Agricultural engineering combines the basic engineering knowledge from three major disciplines and applies it to agriculture; this is what makes agricultural engineering the most versatile branch in engineering. It is concerned with the utilization of all branches of engineering science and technology in the art, science and business of crop production, animal husbandry, as well as handling, processing and preservation, storage, manufacture and distribution of products that feed, shelter and cloth mankind.

Agricultural engineering has been applying scientific principles for the optimal conversion of natural resources into agricultural land, machinery, structure, processes, and systems for the benefit of man. Machinery, for example, multiplies the tiny power (about 0.07 kW) of a farmer into the 70 kW power of a tractor which makes possible the production of food several hundred times more than what a farmer can produce manually.

Processing technology reduces food loss and adds much more nutritional values to agricultural products than they originally had. The role of agricultural engineering is increasing with the dawning of a new century. Agriculture will have to supply not only food, but also other materials such as bio-fuels, organic feed stocks for secondary industries of destruction, and even medical ingredients.

Furthermore, new agricultural technology is also expected to help *reduce* environmental destruction.

1.1 Areas of specialization in Agricultural Engineering

Agricultural Engineering can be divided into six major areas of specializations, namely: Farm Power and Machinery Engineering, Soil and Water Engineering, Processing or Post Harvest Systems Engineering, Farm Structures and Environmental Control Engineering, Forestry and Wood Product Engineering and Food Engineering. Other areas that are emerging from the specializations are Amenity (Ecological) Engineering, Mechatronics and Robotics, Information and Communication Technology, Renewable Energy and Environmental Engineering.

1.1.1 Farm Power and Machinery Engineering

This area deals with the design, construction, operation and maintenance of power and machinery systems needed for all aspects of Agricultural Mechanization. The power aspect refers to the development of all prime movers and power sources for all phases of agricultural production, processing and distribution. These include tractors, electric motors, stationary engines, generators, pumps, truck engines, solar energy, wind mills and hydro power systems. The machinery aspect handles the machines used for production, which may or may not be powered by the power units mentioned above i.e. machines/machineries for land clearing, tillage, planting, tending (weeding and spraying), harvesting and transportation.

1.1.2 Soil and Water Engineering

Soil and water are the basic natural resources for agricultural production. The development and management of these resources must be done scientifically in order to achieve long term sustainability. This aspect of Agricultural Engineering deals with the harnessing and management of the soil and water resources of the ecosystem. The area covers land degradation, soil and water conservation, land reclamation, irrigation technology, land drainage systems, water supply, catchment modeling, hydrology and hydraulics, agricultural waste management and environment. Agricultural Engineers who specialize in this area are involved in the design, construction, installation, operation and management of engineering structures and machines required in the areas listed above. Some of the structures include: dams, canals, erosion control structures, reservoirs, boreholes, irrigation pumps etc.

1.1.3 Post Harvest Systems Engineering

This aspect of Agricultural Engineering deals with all the activities, processes, structures and machines which convert agricultural raw materials (harvested crops) into finished consumer goods. It covers the area of value addition to crops with the aim of converting the crops to more usable form or extends the storage life of the crops. Specialist in this aspect handle the design, construction, operation and management of machines and structures which carry out the following operations: cleaning, sorting, separation, cooling and drying, size reduction, pelleting, extruding, expelling, refining, extraction etc.

In carrying out all these processes, the material has to be conveyed from one point to the other especially in crop/food processing factories. In this case, machines for conveyance, discharging and packaging are very essential.

1.1.4 Farm Structures and Environment Control Engineering

This option in Agricultural engineering deals with the design and construction of all structures that are used in agricultural production. The structures include farm roads, residential buildings, livestock pens, warehouses for storage and food processing, implement sheds and farm shops, storage structures, holding bays for produce. The other aspect of the option deals with the control of environmental factors in farm buildings such as temperature, humidity, light and air. Agricultural waste management is also an important part of the option and it includes waste treatment and recycling, bio gas production, waste conversion etc.

1.1.4 Food Engineering