MASTER'S DEGREE IN AGRICULTURAL ENGINEERING

DESCRIPTION

The Master's Degree in Agricultural Engineering aims at contributing to the scientific and technological development of the region and the country; prepare professionals for research and for the teaching careerin the field through a broad scientific education; develop studies and researches related to agricultural issues with the purpose of providing subsidies for the increase in productivity in Mato Grosso do Suland the surrounding regions.Based on the interaction between class education, research and community outreach, this course is intended to develop professionals with technical and scientific knowledge to work at local, regional and national levels. These professionals will be prepared to work with ethics, be creative and integrative in diagnosing, preventing and solving problems regarding animal and plant production while searching for maintaining and/or improving the socio-economic and environmental quality in the region. Also, graduates from this course will be able to work in higher education or research institutions in the field of agricultural engineering.

Concentration areas:AGRICULTURAL ENGINEERING

Lines of research:

●Water and Soil Engineering

The themes to be approached will be water, soil, plant and atmosphere, hydraulics of free surface and pressurized hydro-agricultural systems, irrigation methods and system, automation and control of hydraulic units, management of hydrographic basins, soil and water management and conservation.

● Agricultural System Engineering

In this line of research there will be an inter and multidisciplinary approach to Agricultural Engineering and this makes it possible to develop, organize and optimize highly complex artificial systems.

SYLLABUS

ACTION AND CONTROL

Concepts about the Generation and Transmission of Electric Energy.Electric Energy Distribution Systems for Rural Electrification. Materials and Equipments used in High and Low Tension Electrical Installations. Installations and Equipment Applied to Irrigation Systems. Projecting and Dimensioning of High and Low Tension Electrical Installations. Use of Small Hydro-Energetic Resources, Alternative Processes for Generation of Energy (wind power, solar energy, biogas).Electric Engines.Electrical Engine Driving.Choosing Electric Engines.Dimensioning Feeding Electrical Cables.Specification and Dimensioning of Protection and Control Devices.

PRECISION AGRICULTURE

Introduction to Precision Agriculture: concepts; rules for adopting technologies; knowledges involved; organization of the system. Management of information: geographic database; production factors to be analyzed; variability of space and time of production factors; ways of collecting data regarding production factors; economic factors and their importance; organization of production factors for management through GIS. Generation of theme maps: application maps; correlation maps; interpretation maps. Forms of control: real-time control; post-processed control. Precision machinery: actuation systems; control systems; machines and equipment; varied rateapplication.

AGROMETEOROLOGY

Introduction. The Earth´s atmosphere. Air pressure and circulation. Solar radiation. Soil and air temperature. Humidity. Wind. Rain. Radiation and energy balance. Frost. Evapotranspiration. Climatological water balance. Climatology. Crop zoning.

RURAL AMBIENCE

Definition and importance.Stress. Main causes of stress. Welfare measures.Wefare and production.Thermal, aerial and acoustic environment.Environmental comfort index. Instrumentation applied to ambience. Ambience and human stress.Relation between animal and the environment.Effects of the environment over production, reproduction and health of animals.Climatic factors and mechanisms of thermoregulation.Genotype-environment interaction.Equipment and forms of controlling thermal comfort in facilities.Equipment and forms of controlling acoustic comfort in facilities. Importance of work safety in Rural environments. Brazilian regulation departments.EUREPGAP.

MULTIVARIATE ANALYSIS APPLIED TO AGRICULTURAL RESEARCH

Fundamentals of Matrix Algebra.Linear transformations.Variance, covariance and correlation matrix.Analysis of the main components.Analysis of factors.Analysis of canonical correlation.Analysis of grouping.Discriminant analysis.

BUILDING AND ENVIRONMENTALLY MONITORING RURAL FACILITIES

Typology of new rural constructions.Conventional and anti-stress facilities.Environmental modelling, prediction and control in facilities. New tendencies for rural construction.Environmental monitoring in rural constructions.Bioenergetic use in rural facilities.

CONTROL OF NATURAL WATERS

Fluid mechanics in hydraulics.Characteristics of free flow.Hydraulic energy and control.Uniform flow.Gradually varied flow.Rapidly varied flow.Theory of saturated subsurface flow.Investigation and diagnosis of drainage problems.Methods and principles of surface and subsurface drainage.Hydric planning for reservation and control. Dimensioning landfills and conducting hydraulic structures. Surface and

subsurface drainage projects. Construction and implementation details of drains.Maintenance and evaluation of drainage systems.

APPLIED ELECTRONICS

Use of electronics in agriculture.Measuring tools and instruments.Symbol and identification of components. Passive components (Resistors, Capacitors e Inductors), magnetism, relays, transformers, semiconductor diode, special diodes, rectifier circuits, bipolar transistor, stabilized tension source, transistor driver circuits, thyristor power control circuits, component tests. Techniques for elaborating and executing circuits for rural environment, elaborating and confectioning printed circuit boards. Welds and welding techniques, simulation of computer circuits.

STUDY OF THE MACHINE-SOIL-PLANT RELATION

Estudo dos principais sistemas de preparo do solo. Estudo das máquinas e implementos agrícolas para o preparo do solo: principais características, tipos de peças ativas e modos de ação no solo, efeito dos equipamentos na camada arável, resposta das plantas e do solo. Estudo do sistema plantio direto e desempenho de semeadoras. Análise do desempenho das máquinas agrícolas de preparo do solo.

TEACHING INTERNSHIP

Special discipline offered to scholarship master's degree students. Teaching activities in the courses offered by the Faculty of Agricultural Sciences (FCA) of UFGD.

AGRICULTURAL EXPERIMENTATION

Basic principles of experimentation.Distribution of frequency.Descriptive statistics.Variance analysis.Experimental design. Average comparison test. Factorial experiments. Subdivided parcel experiments. Factorial experiments with additional

treatments.Joint analysis of experiments.Regression.Correlation.Multivariate analysis.Computer systems for statistical analysis.

GEOESTATISTICS

Principles and applications of geostatistics in soil data, climate, plant, pest and disease analysis, shown in time or in space.Exploratory and descriptive statistical analysis of data.Hypothesis of statistical stationarity.Definitions, calculus equations and semivariogram models.Anisotropy studies.Periodic data analysis.Cross-semivariogram.Co-kriging.Kriging estimation method.Estimate variance.Self-validation method (jack-knifing).

GEOPROCESSING

Introduction to geoprocessing.Concepts and fundamentals of remote sensing.Platforms and sensor systems.Sensing data preprocessing: techniques for image enhancement and filtering.Classifying and processing digital images. Introduction to GIS.Data input and output in GIS. Quality of data in GIS.Data manipulation and management.Analysis function in a GIS. Georeferencing.

HYDROLOGY AND MANAGEMENT OF WATER RESOURCES

Hydrologic cycle.Hydrographic basin.Precipitation.Evaporation and evapotranspiration.Infiltration of water in soil.Surface flow.Study about watercourse flow. Subsurface water.Sediment transport.Water regulations.Water resource management.

SURFACE IRRIGATION

Surface irrigation methods and systems. Land systematization for irrigation.Phases of surface irrigation.Infiltration of water in soil.System performance index.Field data analysis.Procedures for evaluating systems. Surface irrigation system projects.

SOIL AND WATER MANAGEMENT AND CONSERVATION

Soil erosion: mechanisms of erosion and the impacts of soil use and management. Systems of soil preparation: effects and action of agricultural implements. Machines and tools for soil mobilization and their interaction with the soil.Evaluation of the potential of land use for agricultural purposes.Soil compaction and plant development.Soil and water conservation practices.

OPTIMIZATION

Introduction to operational research. Operational research applied to agriculture and cattle raising. Modelling and optimization under linear conditions.Modelling and optimization under non-linear conditions.Network modelling and optimization.

AGRO-INDUSTRIAL REFRIGERATING

The role of refrigeration in agro-industry.Vapor-compression refrigeration cycle: theoretical and real.Refrigeration fluids, main components of a refrigeration system – types and selection, refrigeration systems applied to agro-industry, operation of refrigeration systems, refrigeration chambers, determination of thermal charge, conservation of energy – heat bombs.

WATER-SOIL-PLANT-ATMOSPHERE RELATIONS

Physical-hydric characteristics of the soil.Water storage in soil.Energy state of water in soil.Tensiometry.Energy state of water in the atmosphere.Evapotranspiration.Energy state of water in the soil-plant-atmosphere system.Water balance and tensiometry.

SEMINARS

Definition of scientific knowledge.Types of research. Review of literature. Structure of scientific papers.Elaboration of research projects.Presentation of scientific papers.

STORAGE SYSTEMS FOR AGRICULTURAL PRODUCTS

Grain reception in storage units.Sampling techniques.Plant classification.Storage structuring in Brazil.Characteristics, components and dimensioning of storage systems. Quality of agricultural products while in storage. Preprocessing operations.Transporters.Accident prevention in storage units.Management of storage units.Storage unit projects.

GRAIN DRYING AND AERATION SYSTEMS

Seed formation.Water content in agricultural products.Physical characteristics of agricultural products.Hygroscopy.Psychrometrics.Principles of drying.Grain drying systems.Grain dryer types, characteristics and operation.Drying costs.Grain aeration.Preservation of quality in agricultural products through aeration.Air movement.Management of grain aeration systems.Aeration system projects.

PRESSURIZED IRRIGATION SYSTEMS

System components.Conventional sprinkler systems.Mechanical sprinkler systems. Sprinklers: hydraulic characteristics and performance.Uniformity and

efficiency.Sprinkler chemigation.Sprinkler irrigation projects.General aspects of localized irrigation.Hydraulic dimensioning.Choice of emission device. Fertigation: equipment and application. Water need. Filtering systems.Localized irrigation projects.

APPLIED THERMODYNAMICS

Review of the basic principles (pressure and temperature, unit, pure substance, tables of properties, 1st law, work and heat), mechanical-compression refrigeration cycle (Carnot, ideal and real), absorption refrigeration cycle, heat bombs, Rankine cycle (vapor turbine), Brayton cycle (gas turbine), engine cycles (Otto and Diesel), mixtures (Dalton's model), Psychrometrics – main processes.

SPECIAL TOPICS I

This discipline aims at complementing graduates' education at specific areas so that they can develop their research project.

SPECIAL TOPICS II

Just like the discipline Special Topics I, this discipline aims at complementing graduates' education at specific areas, with more credit hours, considering higher complexity subjects. The best professors in each area will be invited to teach this discipline.