THE MINUTES OF THE PHD STUDY BOARD MEETING ON
PHD STUDY PROGRAM - ENGINEERING OF AGRICULTURAL TECHNOLOGICAL SYSTEMS (EATS)

The PhD Board meeting of the PhD study program - Engineering of Agricultural Technological Systems, was held on January 18th 2023, at 10:30 in Room M54/3 at the Faculty of Engineering, CZU, in person.

The attendance list is enclosed.

AGENDA:

1. Welcome and introduction by prof. Herak (The Head of the PhD Board).
2. Presentation on Progress of the Dissertation Research by the PhD Students.
    a. *Mr Vijay Chandan:* The PhD student's performance was outstanding and appreciated. The PhD board had a few comments regarding his study's scientific impact and novelty. The PhD board recommended reconsidering the objectives of his dissertation thesis.
    b. *Mrs Sri Letsoin Murniani:* The PhD student's performance was outstanding and appreciated. The PhD board commented that an overview of Sago should also be added to the presentation for better familiarization with this unknown palm; the board also very critically commented that the presenting student should keep the given time of the presentation. The PhD board was impressed and looked forward to completing the PhD study in a few months.
3. Approval of the Progress of the PhD Study Program – EATS
    a. *Mr Vijay Chandan:* The PhD Board recommended the PhD student to continue the PhD study program – EATS.
    b. *Mrs Sri Letsoin Murniani:* The PhD Board recommended the PhD student to continue the PhD study program – EATS.
4. Approval of the Drafts of New Dissertation Topics
    a. All dissertation topics listed below were unanimously approved.

5. PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Prof. Ing. David Herák, Ph.D.
Department	Mechanical Engineering

Topic	**Utilization of the finite element method to describe the mechanical behaviour of oilseeds under compression loading**
Annotation	The aim of the dissertation thesis is to create models of mechanical behaviour of oilseeds using the finite element method. These models will describe the mechanical behaviour of the bulk seeds under compression loading, the relaxation behaviour, the creep behaviour, as well as the oil points. Models should be used to create the "digital twin of the seed". Models should be created using the ANSYS system.
Compliance with targets of EATS study program	The topic fits into the essence of the idea of industry 4.0 and agriculture 4.0, respectively

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Prof. Ing. David Herák, Ph.D.
Department	Mechanical Engineering
Topic	**The implementation of AI algorithm for carbon measurement on oil palm plantations**
Annotation	The aim of this dissertation thesis is to develop an AI-based measurement model of carbon balance on oil palm plantation based on Eddy covariance acquired flux data of CO_2, CH_4, and H_2O sensors. It is included studying CO_2 flux from oil palm land, CO_2 flux (net flux), the relative contribution of oil palm plant material decomposition to subsidence, CO_2 uptake by plants, dissolved C (DOC), and C release. The eddy covariance (also known as eddy correlation and eddy flux) technique is a key measurement technique to measure and calculate vertical turbulent fluxes within atmospheric boundary layers. . Models should be used to create the "digital twin of the oil palm plantation". Models should be created using the ANSYS system.
Compliance with targets of EATS study program	The topic fits into the essence of the idea of industry 4.0 and agriculture 4.0, respectively

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Asc. Prof. Rostislav Choteborsky, Ph.D.
Department	Material Science and Manufacturing Technology
Topic	**Modelling of particulate matter and its interaction**
Annotation	The aim of the dissertation thesis is to create simulations for the behaviour of selected particulate matter (e.g. soil, cereals, etc.). This model will be correlated with experimental data. The dissertation thesis will focus on the creation of a mathematical model using a numerical solution in SciLab using discrete element methods. Evaluation of the model is necessary to verification of the boundary conditions of experiments (such as bulk angle, internal friction angle, coefficient of friction between particulate matter and wall). To determine these boundary conditions, the student can make use of existing equipment's available at the department or make own new equipment.

Compliance with targets of EATS study program	Dissertation thesis is in target of EATS study program, the aim of thesis is according to "Agriculture 4.0" and thesis will solute one of issues in this innovation strategy – digital twin.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	doc. Rajesh Mishra, PhD
Department	Material Science and Manufacturing Technology
Topic	**Agricultural waste based composite panels for sound and thermal insulation**
Annotation	The aim of the dissertation thesis is to utilize agricultural waste materials as reinforcement to develop composite materials. These materials are expected to serve as thermal and sound insulation in the building construction. The thesis will focus on evaluation and characterization of thermal as well as noise absorption, transmission, and insulation performance of such composite materials. The influence of porosity and density will be studied in detail. Theoretical and computational models will be implemented and further developed.
Compliance with targets of EATS study program	The topic fits into the essence of the idea of industry 4.0 and agriculture 4.0, respectively

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	doc. Rajesh Mishra, PhD
Department	Material Science and Manufacturing Technology
Topic	**Additive manufacturing of 3D printed composite materials reinforced with cellulose nanocrystals derived from agro-based waste materials**
Annotation	The aim of the dissertation thesis is to utilize agricultural wastes with lignocellulosic content in the nanoscale for the 3D printing of composite products. Polymeric nanocomposites with cellulose nanocrystals will be developed by using the state-of-the-art 3D printing technology. The influence of doping percentage and the size of the crystals on the process and product characteristics will be studied in detail. The performance of the 3D printing process and the product will be evaluated in terms of mechanical and thermal fatigue. Computational analysis of the additive manufacturing using 3D printing technology will be developed by considering the features of the nanocrystals.
Compliance with targets of EATS study program	The topic fits into the essence of the idea of industry 4.0 and agriculture 4.0, respectively

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	doc. Ing. Zdeněk Aleš, Ph.D.
Department	Department of Quality and Dependability of Machines
Topic	Design of an optimization model for the optimization of the preventive maintenance interval

Annotation	Today's modern agricultural and processing companies use complex machines and equipment including automated or robotic systems. These machines are usually key objects for the company, and it is therefore necessary to ensure proper maintenance, as the failure of these machines is very costly for companies. The mentioned technologies enable the collection of a large amount of not only data from operation, but also operational data concerning technical condition and faults. This data must be processed using algorithms to obtain feedback for decisions on preventive maintenance. Information technology allows users to create simulations that can be used retrospectively to plan maintenance activities. The aim of dissertation thesis is to propose of an optimization model for the optimization of the preventive maintenance interval using information technology.
Compliance with targets of EATS study program	The topic is closely related to the compulsory optional study subject Restoration of machines and equipment using information technology.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Doc. Ing. Abraham Kabutey, Ph.D.
Department	Mechanical Engineering
Topic	**Mechanical and rheological properties of selected bulk oilseeds under quasi-static and dynamic loadings.**
Annotation	The research is seeking to obtain adequate information on both the experimental and theoretical concepts of the mechanical and rheological properties of selected bulk oilseeds (camelina seeds, pumpkin seeds, sesame seeds among others) under quasi-static and dynamic tests using the universal compression testing machine.
Compliance with targets of EATS study program	The dissertation thesis is within the EATS study programme and Agriculture 4.0. to aid in the design of efficient technology for processing oilseeds in the rural areas of developing countries.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Doc. Ing. Abraham Kabutey, Ph.D.
Department	Mechanical Engineering
Topic	**Experiments, modelling and optimization of processing parameters of edible oil extraction from laboratory to industrial scale.**
Annotation	Mechanical pressing is generally preferred and widely used for oil extraction from oilseeds because of its great advantage of producing high-quality oil. In the literature, there is still the need to conduct further research to understand its complexities (moisture content, extraction time, pressing temperature, speed, applied pressure, diameter of pressing vessel, friction between the seeds and the walls of the pressing vessel and plunger, nozzle sizes, pressing heads or heating sleeves diameter, press cylinders sizes and screw pitch diameter) which thus affect the pressing process in terms of oil extraction efficiency and energy

	requirement. These factors, however, can be understood first under the laboratory scale based on appropriate experimental designs, statistical techniques, and optimization concepts.
Compliance with targets of EATS study program	The dissertation thesis is within the EATS study programme and Agriculture 4.0. to aid in the design of efficient technology for processing oilseeds in the rural areas of developing countries.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Doc. Ing. Abraham Kabutey, Ph.D.
Department	Mechanical Engineering
Topic	**Application of machine learning algorithms for describing drying kinetics of agricultural products.**
Annotation	The drying of agricultural produce entails a complex thermal process in which simultaneous heat and mass transfer occur. The process ensures the reduction of moisture content in the agricultural product to extend the shelf life. The drying kinetics of a product depends on various factors such as hot air-speed, initial moisture content, final moisture content, relative humidity, temperature, dimensions, form, composition, external surface, intermittence, pressure, and porosity, among others. Kinetic modelling of process parameters by employing supervised machine learning models such as linear regression, K-means clustering, support vector machine among others is very useful in food processing.
Compliance with targets of EATS study program	The dissertation thesis is within the EATS study programme and Agriculture 4.0. to aid in the design of efficient drying technology for processing agricultural products in developing countries.

6. Any other business

    a. Further discussions focused on strengthening international cooperation related to the PhD study program.

    b. The PhD board members recommended to the PhD students send their soft copies of presentations a minimum of one week before the PhD board's annual meeting.

Prague, January 18th, 2023

prof. Ing. David Herák, Ph.D.

Head of PhD Board