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MINUTES OF THE PhD STUDY BOARD MEETING

PhD Study Program: Engineering of Agricultural Technological Systems (EATS)

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The PhD Board meeting for the PhD study program in Engineering of Agricultural Technological Systems (EATS) was held in person on January 21st, 2026, at 9:00 AM in Room M54/III at the Faculty of Engineering, CZU. The attendance list is attached.

AGENDA:

1. **Welcome and Introduction**
   - Prof. Herák, Head of the PhD Board, opened the meeting.

Information on Online Approval of Proposed PhD Topics
   - The PhD Board was informed about the unanimous online approval of the proposed PhD topics entitled *"Sensor Fusion Systems for Autonomous Navigation of an Unmanned Agricultural Ground Vehicle in GNSS-Limited Environments"*, conducted on 31 October 2025.

2. **Presentation on the Progress of Dissertation Research**
   - PhD student Mr Shamistan Nazarov, a first-year doctoral student, presented the methodology of his dissertation research.
   - The presentation focused on the planned research framework and methodological approach.
   - Members of the PhD Board raised questions and provided comments concerning:
     o Detailed research objectives,
     o Planned field tests,
     o Application of sensors and sensor systems,
     o Technical aspects of the use of English,
     o Overall study timeline.

3. **Approval of Study Progress – PhD Student Mr Shamistan Nazarov**
   - The PhD Board recommended that Mr Shamistan Nazarov continue in the PhD study programme, *Engineering of Agricultural Technological Systems (EATS)*.
   - The PhD Board further recommended refining the methodological timeline of the dissertation in the submitted Methodology, including the addition of proposed conference outputs.
   - Based on the detailed information provided on the proposed financial support and the funding opportunities available within the SmartAgri Cambodia project, the PhD Board

approved the revised topic of the dissertation thesis as *"Sensor Fusion Systems for Autonomous Navigation of an Unmanned Agricultural Ground Vehicle in GNSS-Limited Environments."*

4. Approval of Drafts of New Dissertation Topics

- The PhD Board unanimously approved all newly presented dissertation topic drafts.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	prof. Rajesh Kumar Mishra, Ph.D.
Department	Material Science and Manufacturing Technology
Topic	Agro waste processing and utilization in green composites/nanocomposites
Annotation	The topic deals with reuse and recycling of agro waste products including fibrous wastes to be used as reinforcement in green composite materials. Further, the micro-nanoscale refinement of cellulose derived from such material will be used to enhance the mechanical, thermomechanical and other functional performances. The theoretical moels and numerical analysis will be done to predict selected mechanical performance of the material. The results will be compared with experimental samples developed sith similar specifications. Product prototypes will be evaluated for practical solution of components in vehicles and transport systems in vatious industrial sectors. Optimized prediction of the product composition and design will be carried out using adequate digital methodology e.g., machine learning, artificial neural network (ANN) or other techniques.
Compliance with targets of the EATS study program	The topic is inline with the study program EATS, Industry-4.0/5.0, Agriculture-4.0/5.0.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	prof. Rajesh Kumar Mishra, Ph.D.
Department	Material Science and Manufacturing Technology
Topic	Biopolymers based degradable composite food packaging material
Annotation	The research aims at developing a new generation of packaging materials derived from biopolymers and reinforced with nanocrystalline cellulose so as to make it degradable at the end of life while retaining its basic functionality. The biopolymers will be based on Polyvinyl alcohol (PVA), Polylactic acid (PLA), bacterial cellulose etc. The nanocellulose will be derived from agro waste fibrous materials. A nontoxic top-down approach based on planetary ball milling will be involved to derive nanocrystalline

	cellulose from waste fibers. The mechanical, chemical recycling of the new packaging materials used in the food packaging industry will be achieved. The balance between the mechanical and chemical stability while protecting the content and at the same time easy and environment friendly degradation/recycling at the end of life will be investigated.
Compliance with targets of the EATS study program	The topic is inline with the study program EATS, Industry-4.0/5.0, Agriculture-4.0/5.0.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Doc. Ing. Abraham Kabutey, Ph.D.
Department	Mechanical Engineering
Topic	**Analysis of the effect of thermal processing on the oil extraction responses of selected oilseeds under screw pressing**
Annotation	Mechanical pressing is widely used for oil extraction from edible oilseeds due to its several advantages such as high-oil quality production. From the literature perspective, continuing research is still required to understand the complexities in mechanical screw pressing operation in terms of the input processing factors such as heating temperature, heating time, moisture content, applied pressure, among others. These input factors thus affect the pressing process regarding the oil extraction efficiency, energy requirement and the residual oil in the press cake. These factors can be understood first under the laboratory-scale research by applying appropriate experimental designs, statistical techniques and optimization concepts to achieving higher quality of oil, higher oil extraction efficiency and optimal energy efficiency. In this research, the oilseeds will be selected based on literature information.
Compliance with targets of EATS study program	The dissertation thesis is within the EATS study programme to aid in the design of an efficient oil extraction systems.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Doc. Ing. Abraham Kabutey, Ph.D.
Department	Mechanical Engineering
Topic	**Utilization of machine learning algorithms for describing drying kinetics of thin-layer and bulk agricultural produce**

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. Selected agricultural produce will be examined under various drying conditions (hot-air oven, infrared and vacuum) where the input and output drying parameters will be subjected to statistical, modelling and optimization techniques.
Compliance with targets of EATS study program	The dissertation thesis is within the EATS study programme to aid in the design of an efficient drying systems.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Doc. Ing. Abraham Kabutey, Ph.D.
Department	Mechanical Engineering
Topic	**Determination of physiochemical properties and FTIR spectral analysis with chemometrics of extracted edible oils**
Annotation	Quality edible oil parameters need to be established to preserve consumer awareness and safety. The nutritional value and sensory characteristics of edible oils are compromised by rancidity development leading to spoilage. The sensory qualities of edible oils include colour, brightness, smell, flavour and aroma as well as the age of the oil which are influenced by several factors during the production process. Edible oils will be extracted under mechanical screw and linear pressing methods. The sensory qualities of the extracted oils will be evaluated by using a combination of sensory and analytical methods. The chemical properties namely peroxide value, acid value, iodine value, free fatty acid and absorption peaks will be examined by means of chemical titration technique and FTIR (Fourier Transform Infrared) spectroscopy. The quality of edible oils is also influenced by its fatty acid composition which will be analysed using appropriate instrumentation. The chemical data will be analysed by mathematical and statistical chemometric techniques.

Compliance with targets of EATS study program	The dissertation thesis is within the EATS study programme to aid in the quality control in food systems.

PhD Program	**Engineering of Agricultural Technological Systems**
Supervisor	Prof. Ing. Rostislav Choteborsky, Ph.D.
Department	Material Science and Manufacturing Technology
Topic	**Modeling of particulate matter and its interaction**
Annotation	The aim of the dissertation thesis is to create simulations for the behavior 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	Prof. Ing. David Herák, Ph.D.
Department	Mechanical Engineering
Topic	**Utilisation of the finite element method to describe the mechanical behavior of oilseeds under compression loading**
Annotation	The dissertation thesis aims to create comprehensive models of the 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", which will show the same mechanical and physical behaviour as the real oilseed in the context of oilseed pressing. 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.

5. Any Other Business

- The PhD Board discussed opportunities to strengthen international cooperation within the PhD study programme.
- The upcoming amendment to the Higher Education Act and its potential impact on doctoral studies were addressed.
- The PhD Board unanimously agreed to prepare accreditation also for the combined (part-time) form of the PhD study program '*Engineering of Agricultural Technological Systems* (EATS)'.

Prague, January 27th, 2026

prof. Ing. David Herák, Ph.D.
Head of PhD Board