**Competition topics for the academic position of Professor, position no. 11**

**Advanced Methods of Experimental Research**

1. Basic concepts of measurement. Measurement systems. Influence quantities in the measurement process.
2. Measurement principles and methods. Parametric transducers. Generating transducers.
3. Experimental measurement of stresses and strains. Circuits for transducer connection.
4. Statistical processing of experimental data.
5. Displacement measurement methods. Velocity measurement methods.
6. Force, torque, and power measurement methods.
7. Pressure measurement methods. Temperature measurement methods.
8. Methods and principles for surface roughness measurement.
9. Vibration measurement methods in mechanical systems.

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**Optimization of Mobile Mechanical Systems**

1. Kinematic modeling of mobile mechanical systems using computational methods.
2. Dynamic modeling of mobile mechanical systems using computational methods.
3. General formulation of an optimization problem. Stages of the optimization process.
4. Development of the mechanical system model to be optimized. Classification and characteristics of models; mathematical models.
5. Classification of optimization methods. General objectives of optimization.
6. Parametric optimization of mobile mechanical systems. Direct and indirect methods, with equality/inequality constraints and unconstrained, involving one or multiple decision variables.
7. Topological (structural) optimization of mechanical structures using the finite element method.
8. Theoretical aspects regarding the use of software products for the optimization of mobile mechanical systems (ADAMS, ANSYS).
9. Applied case study on the optimization of a mobile mechanical system using parametric methods.

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**3. Architecture of hybrid and electric vehicles**

1. History of Electrical Vehicle
2. Dynamics of Electric and Hybrid vehicles
3. Microhybrid type architecture for hybrid vehicles
4. Mild hybrid type architecture for hybrid vehicles.
5. Architecture of Hybrid and Electric Vehicles. Basic Architecture of Hybrid Drive Trains and Analysis of Series Drive Train
6. Parallel type architecture for hybrid vehicles
7. Series-parallel type architecture for hybrid vehicles

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