## *ABSTRACT*

*Bridges are supporting infrastructure which is an important means of encouraging Indonesia's economic growth. Bridges generally have elastic properties when they are in prime condition, where they will return to their original position when a load such as a vehicle passes over them. However, age factors and uncertain environmental conditions can affect the elasticity of the bridge. To overcome this problem, this research develops and tests a prototype-based bridge safety monitoring system to monitor bridge elasticity using the MPU6050 sensor with an experimental approach using a 1:75 scale prototype for bridges and a 1:55 scale for trucks. This system is also equipped with an ESP32 Cam which functions as an Access Point, enabling real-time monitoring via CCTV. Users can access the IP address 192.168.4.1 to view the bridge condition directly and move the servo to expand the observation coverage. Furthermore, the system uses a load cell to measure vehicle loads with high accuracy. With the existing dataset, an average error of 0.96% was obtained and the average accuracy reached 99.04% deviation between the load cell reading and the reference scale. The get_units() method is used in the HX711 library to convert signals from a load cell into understandable weight units, such as grams. This system is able to identify vehicles with loads exceeding the maximum limit of 175 grams, which then activates access controls such as servo motors for barrier gates and LED indicators and vehicle load readings can access the IP address 192.168.4.2. The MPU6050 sensor is used to measure the roll and pitch angles of the bridge, the reading results can be seen on the LCD display, with the aim of monitoring the elasticity of the bridge, by calibrating the sensor it is found that the roll value has been successfully stabilized to between 0.01 to 0.04 degrees after calibration. Likewise, the pitch value becomes stable with a variation of between 0.02 to 0.07 degrees after calibration and can be used to monitor variations in conditions when the load crosses the bridge. This research integrates technologies that have proven effective in monitoring and ensuring the safety of bridge infrastructure. The results not only improve understanding of bridge load and slope dynamics, but also offer practical solutions to reduce the risk of accidents and extend the service life of infrastructure that is crucial for Indonesia's economic growth.*



***Keyword:*** *Bridge Safety, Elasticity, MPU6050 Sensor, Load Cell*