

# **An Approach of Project Based Learning design for Autonomous Vehicle Course in Online Class**

**Joko Slamet Saputro<sup>1</sup>, Miftahul Anwar<sup>2</sup>, Feri Adriyanto<sup>3</sup> and Hari Maghfiroh<sup>4</sup>**

Department of Electrical Engineering, Faculty of Engineering,

Universitas Sebelas Maret, Jl. Ir. Sutami, 36 A, Surakarta, Indonesia

<sup>1</sup>[Jssaputro89@staff.uns.ac.id](mailto:Jssaputro89@staff.uns.ac.id), <sup>2</sup>[miftahwar@staff.uns.ac.id](mailto:miftahwar@staff.uns.ac.id), <sup>3</sup>[feri.adriyanto@staff.uns.ac.id](mailto:feri.adriyanto@staff.uns.ac.id),

<sup>4</sup>[hari.maghfiroh@staff.uns.ac.id](mailto:hari.maghfiroh@staff.uns.ac.id)

## **Abstract**

The pandemic that hit the world had an impact on all sectors, Higher education was one of the sectors affected. Even though it is in the non-essential sector, universities have variables with a high heterogeneity level, so it is risky if they continue to carry out classical learning (in class). The Outcome Based Education (OBE) curriculum applied to the electrical engineering department is a challenge for lecturers to continue giving lectures by considering the achievement of the set output targets. case studies of online learning are applied to the intelligent vehicle course using a project-based learning method approach. The approach in question is to continue to adopt the stages of project-based learning but with an online approach using video conferencing facilities. As for the implementation, students are divided into 3 small groups, each group consists of 3-4 members, each group can choose the project of interest, but has different projects and problems. each project that has been done can later be integrated into a complete project that illustrates how a smart vehicle can run from autonomously using lane-keeping features on the road. Students work on projects using open source simulation software, namely Webots Simulator. Each group works independently and actively based on their respective duties, to monitor the progress of the project, discussions are held every week under the guidance of a lecturer. The results of this lecture show that the online project-based learning model has been successfully implemented, each group is able to complete the project well and as an outcome of this learning, the three projects can be integrated into a prototype vehicle that can run autonomously without getting off the track, recognizing signs traffic and intersections to parking in available areas. By using the Project Based Learning approach, we also demonstrate the teaching process as an engineering capstone design project.

## **Keywords**

Autonomous vehicle, project based learning, Webots Simulator, electric vehicles, and Lane-keeping

## Biographies

**Joko Slamet Saputro** is a member of FORTEI. He obtained his bachelor's from department of Mechatronics Engineering Education, Yogyakarta State University and master's degree from the Department of Electrical Engineering, Bandung Institut Technology, Indonesia. He is currently a lecturer in the Department of Electrical Engineering, Universitas Sebelas Maret, Indonesia. His researches interests involve control systems, mechatronics, intelligent systems, autonomous systems, Robotics and electric vehicles.

**Miftahul Anwar** is a member of FORTEI and IEEE. He obtained his bachelor's from Department of Physics, Universits Indonesia, master's and Doctoral degree from Shizouka University, Japan. He is currently a lecturer in the Department of Electrical Engineering, Sebelas Maret University, Indonesia. His researches interests involve nano material, electric vehicles, and plasma energy.

**Feri Adriyanto** is a member of FORTEI and IEEE. He obtained his bachelor's from Department of Physics, Yogyakarta State University, Indonesia, master's degree from the Department of Physic Engineering, Bandung Institut Technology, Indonesia, and Doctoral degree from National Cheng Kung University, Taiwan. He also joints Postdoctoral at Universiti Tun Hussein Onn Malaysia. He is currently a lecturer in the Department of Electrical Engineering, Sebelas Maret University, Indonesia. His researches interests involve microelectronics, tin film, nano sensor, and photovoltaics.

**HARI MAGHIROH** is a member of IAENG. He obtained his bachelor's and master's degree from the Department of Electrical Engineering and Information Technology, Universitas Gadjah Mada, Indonesia in 2013 and 2014. He also joints a double degree master program at the National Taiwan University of Science and Technology in 2014. He is currently a lecturer in the Department of Electrical Engineering, Sebelas Maret University, Indonesia. His researches interests involve control systems, electric vehicles, and railway systems.