



UNIVERSITI MALAYA

It is hereby certified that

**IKA ZENITA RATNANINGSIH**

having fulfilled the requirements prescribed by the University for the programme of study and with the assent of the Senate was awarded the

**DEGREE OF  
DOCTOR OF PHILOSOPHY**



Professor Dato' Seri Ir. Dr. Noor Azuan Abu Osman  
Vice-Chancellor

Professor Ir. Dr. Abdul Aziz Abdul Raman  
Acting Registrar

Senate Date : 26 September 2024