

**UNIVERSITI TEKNOLOGI MARA**

**TECHNICAL REPORT**

**AN APPLICATION OF SIR MODEL IN  
THE OUTBREAKS OF EBOLA**

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**Report submitted in partial fulfillment of the requirement  
for the degree of  
Bachelor of Science (Hons.) Mathematics  
Center of Mathematics Studies  
Faculty of Computer and Mathematical Sciences**

**JANUARY 2017**

## ACKNOWLEDGEMENTS

Firstly, I was grateful to Allah S.W.T for giving me the opportunity and strength to complete this project with successfully. I would like to express my gratitude and appreciation to the head coordinator Madam Wan Roslini binti Wan Yusoff for giving me the opportunity to complete my final year project. Then my thankful to Madam Wan Khairiyah Hulaini binti Wan Ramli, final year project (FYP) coordinator for giving me helpful guide to complete this paper. Then, I also give my special thanks to Madam Zati Iwani binti Abdul Manaf as my supervisor who is always helped me and guide me a lot to complete this project succesfully. Finally I would like to say thank you to all lecturers and friends who influenced and supported me on this project paper.

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## ABSTRACT

Ebola virus disease has been a great health crisis in Africa for many years. This unctrollable virus had globally addressed since it had cause a lot of deaths. In this paper, the outbreaks of Ebola virus has been investigate by applying the mathematical model. The mathematical model used is SIR model and the data for this case is taken from World Health Organization (WHO) located in Sierra Leone for the year 2015. A set of parameter value is used to fit the data and this study also focused on initial number of infectives to compare the effects on varying compartments which is susceptible, infected and recovered population. The interpretation of the results are done by using Maple Software and Dsolve tool. From the comparison, prediction made in initial number of infectives help to observe the behavior of the spread of the virus in the population. From the observation, the virus of Ebola take several days to spread depend on the value of infected individuals in the population. Therefore, from the finding a prediction of the behavior of the virus can be made to control it in the next outbreak.

# 1 INTRODUCTION

## 1.1 Research Background

Ebola Virus Disease (EVD), is a viral infection that is caused by a virus of the family Filoviridae, genus Ebolavirus (Khan et al., 2015). The period of incubation of Ebola is between 2-21 days, and the period of infection is 4-10 days. Ebola can be transmitted through unmediated contact with the blood, skin, or body fluids of an infected animal or individual. Ebola virus is found to stay in semen for a period up to three months. According to Khan et al. (2015), since 1976, from the observation of the outbreaks of Ebola virus it cannot be transferred naturally through air, water, and foods like influenza or diarrhea disease. Common symptoms of Ebola virus which are commonly start two days until three weeks and the symptoms are fever, malaise, myalgia, sore throat, chest pain, hiccups, red eyes, weakness, diarrhea, stomach pain, vomiting, dehydration, hacking and dry cough, and no appetite. It is difficult to diagnose the Ebola virus because it is usually misdiagnosed as typhoid and malaria. The body will undergo severe blood loss and coagulation abnormalities as the infection of EVD spreads. If it is not treated and diagnosed, usually death can occur in the week two of the symptoms and it is also regularly caused by a lot of blood loss.

The origins of the name Ebola was taken from a name of a river means "Black River" that is located at Yambuku. The river was at first found near Yambuku by the scientist but it was not, however the name Ebola still been used and join the list of virus named after river. Consequently, the Ebola Virus Disease outbreak has been declared by the World Health Organisation on 23 March 2014, firstly occurred in Yambuku, Zaire and its surrounding areas in 1976 (Bekoe, 2015). Then the virus outbreak continues to spread in large numbers which is latest in Guinea, Liberia and Sierra Leone. The largest outbreak of EVD is in West Africa, with 3944 cases reported in 5 September 2014 (World Health Organisation, 2014). According to Bekoe (2015), from the first confirmed case recorded on 23 March 2014 which more than 18 months,