

ME 476C-002

To: Dr. Sarah Oman

Team: “Team 4” Abdulwahab Zaidan, Ali Abdullah, Omar Alajmi, Salman Malallah

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Re: Analytical Analyses I Team Memo

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INTRODUCTION

This analytical analysis team memo will present the 4 major task of the team F04 to develop an affordable and available passive 3D printed mechanical prosthesis for below-knee amputees. Task assigned to each team member will be described in the following section. These sections will present the important characteristics of the product along with the research and engineering calculations needs to be performed and the individual in charge of it. The four important characteristics which are vital to the product are the use of springs, hydraulic system, material and human factor engineering.

SPRING (Ali Abdullah):

The use of spring is most vital for developing the mechanical prosthesis for below-knee amputees. The springs helps in absorbing the push offered by the prosthetic leg to the amputees. So, springs are important to be used to enhance the amputee’s mobility and comfort. So, there is a need to study the behavior of the spring to develop a push off mechanism to absorb the shock generated during movement. By studying the behavior of the spring available the team will be able to select the best spring which suits all the requirement. All the research and engineering calculation will be performed by Ali and he will be in charge of all the research and engineering calculation pertaining to the spring selection which will lead to the customer satisfaction.

HYDRALIC SYSTEM (Abdulwahab Zaidan):

The prosthetic leg should also facilitate to walk on the sloped terrain. To walk on the sloped terrain, able- body individuals adjust the posture of the ankle. Then, this behavior must be modelled so that the ankle of the prosthetic leg can assist the movement of amputees in all terrain. Adjustment in the ankle posture will be achieved by incorporating the hydraulic system. At the ankle joint a bearing can be used to adjust the posture of the ankle by rotation. By analysis the characteristics of ankle joints and bearing, the team will be able to select the type and size of the bearing. This analysis will also help in developing the better understanding of the light weight bearing.

MATERIAL (Omar Alajmi):

3D printed mechanical prosthesis for below-knee amputees should be affordable, available and light weight. Selection of appropriate material plays an important role towards the success of the product. All the material will be explored to optimize the cost, weight and strength of prosthetic leg. The prosthetic leg will be subject to the compressive load since it will be directly attached to the human body. The concept of mechanics of material will be employed to get the compressive

stress and will be compared against the material strength to figure out that the product will not fail. Material selection will also help the team in finding out that the performance of the product will not hamper due to change in weather conditions.

HUMAN FACTOR ENGINEERING (Salman Malallah):

Since the product will be used by the people of different age and heights. The developed prosthetic leg must suit to large no. of amputees, So, human factor engineering must be incorporated. It examines the relationship between human being by focusing on enhancing efficiency, satisfaction and safety of the users. This will help us in determining the length of the prosthetic leg. It will also ensure the safety of the humans and comfortability to wear and use. The team should also reach out to the clients to learn how to properly fit and adjust the design of the product to each specific person to ensure the customer satisfaction and success of the product.