

## Modeling and Analysis of a Cycling Prosthetic

**Authors :** John Tolentino, Yong Seok Park

**Abstract :** There are currently many people living with limb loss in the USA. The main causes for amputation can range from vascular disease, to trauma, or cancer. This number is expected increase over the next decade. Many patients have a single prosthetic for the first year but end up getting a second one to accommodate their changing physique. Afterwards, the prosthesis gets replaced every three to five years depending on how often it is used. This could cost the patient up to \$500,000 throughout their lifetime. Complications do not end there, however. Due to the absence of nerves, it becomes more difficult to traverse terrain with a prosthetic. Moving on an incline or decline becomes difficult, thus curbs and stairs can be a challenge. Certain physical activities, such as cycling, could be even more strenuous. It will need to be relearned to accommodate for the change in weight, center of gravity, and transfer of energy from the leg to the pedal. The purpose of this research project is to develop a new, alternate below-knee cycling prosthetic using Dieter & Schmidt's design process approach. It will be subjected to fatigue analysis under dynamic loading to observe the limitations as well as the strengths and weaknesses of the prosthetic. Benchmark comparisons will be made between existing prosthetics and the proposed one, examining the benefits and disadvantages. The resulting prosthetic will be 3D printed using acrylonitrile butadiene styrene (ABS) or polycarbonate (PC) plastic.

**Keywords :** 3D Printing, Cycling, Prosthetic design, Synthetic design.

**Conference Title :** ICMEDA 2020 : International Conference on Mechanical Engineering Design and Analysis

**Conference Location :** New York, United States

**Conference Dates :** April 23-24, 2020