The Open Access Journal of Science and Technology
vol. 10 (2022), Article ID 005, 2 pages
doi:10.11131/OAJOST.2022.10.005

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Editorial

Mechanical Engineering Applications in Medicine and Biology: Recent Advances

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Dates
Received: 30-Mar-2022, Manuscript No. OAJOST-22-59075; Editor assigned: 01-Apr-2022, PreQC No. OAJOST-22-59075 (PQ); Reviewed: 15-Apr-2022, QC No. OAJOST-22-59075; Revised: 26-Sep-2022, Manuscript No. OAJOST-22-59075 (R); Published: 03-Oct-2022, DOI: 10.11131/ OAJOST.2022.10.005

1. Editorial

Mechanical engineering is a broad engineering subject with a wide variety of functions and functions that require the design and manufacture of medical technologies ranging from small individual components and devices to large systems that can participate in almost every aspect of technology. It covers topics related to energy, fluid mechanics and dynamics, robotics, solid mechanics, heat transfer, design and manufacture, maintenance and control. This diverse background plays a key role in defining, orienting and solving the global problems and challenges of many fields of interest outside of mechanical technologies for mechanical engineers and scholars to define the future of technology. Medicine and biology have been adopted through mechanistic principles and theories such as the complete role of mass transport and diffusivity equations on pharmacokinetics and pharmacodynamics to understand the primary role of orthopedics in immunology or cardiovascular physiology and pathology. We can cite a number of issues and emergencies in engineering, biology and healthcare, including engineering mechanisms, processes, bio sensors and bio devices, where mechanics is the key player and key to problem solving.

Biomechanics is the application of mechanical principles in the study of organisms, their kinematics (description of motion) and kinetics (actions of forces associated with motion), which sees the human body as a set of levers, made up of bones, which are moved by its muscles. In sport and exercise, mechanics can be involved in evaluating the performance of athletes based on their interaction with equipment. Biomechanics, which ranges from the cellular internal workings to the moving forces acting on organs, has been the subject of much research by mechanical engineers and scholars in other mechanical techniques. In recent years, numerous attempts have been made to improve biomechanical research and innovation in the field of tissue engineering as well as to develop sport biomechanics and biomechanics.

Nanotechnology is the understanding of the behavior of matter in infinite dimensions called nanometers (nanometer is a billionth of a meter; human hair is approximately 75000 nanometers in diameter), where amazing properties enable applications to emerge. Considering the combination of nanoscale science, engineering and technology, nanotechnology manipulates sensing, imaging, measurement, manufacturing, control and nanoscale matter. In mechanics, the integration of nanotechnology focuses on three main areas: nanostructures (carbon nano-tubes), nano fluids, micro fluids, and nanobotics.

Nano mechanics, which studies nanoscale machinery and fluid dynamics, is one of the emerging disciplines in science and technology over the past decade. Research and development in this field focuses on the introduction of nano robotics in surgery and medical treatment. The research that doctors do in this area needs to be more adventurous and creative. Microbial CNTs are expected to play an important role in medicine and biology in improving the way we live through biological diagnostics using biosensors to identify molecules and organs, as well as the mechanical, optical, thermal, electrical and chemical properties of CNT made of silicon nanowires. Building materials for DNA delivery and sensing of proteins. Therefore, research in this field is very promising for mechanical scholars.

Computational Fluid Dynamics (CFD) is an engineering tool that integrates mechanics into mathematics and software programming, implementing a fluid (liquid or gas simulation) based on the Navier Stokes equations, the main mathematical formulation that makes up all the phenomena of liquid mechanics. The solution of these equations is explained by implementing structural and structural meshes using numerical methods such as (finite volume method and finite element method). CFD has been a tool for analyzing air currents around cars and aircraft since the beginning of the 20th century and operating data centers and electronic chip cooling systems. CFD software such as Ansys, Solidworks, Openfoam, ADINA, etc., play a key role in medicine and biology, where researchers create virtual reconstructions of various human organs, surgical options and circulatory systems, combining fluid dynamics results with a simplified design of the human body as vascular and pulmonary systems. The simulations can actually estimate the blood flow distribution across the arteries and the energy losses at possible surgical connections. CFD tools to implement certain simulations for blood flow, cardiac pumping and inertia, surgical procedure and external impact on the human body. Because experimental data are not available, CFD simulation is more theoretical, requiring collaboration between medical scientists and clinicians to maintain real time simulations and achieve consistent results.

doi:10.11131/OAJOST.2022.10.005 (MRPFT)